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**Republic of Ghana
Root and Tuber Improvement Programme
Interim Evaluation**

**October 2004
Report N° 1533-GH**

Photo on cover page
Republic of Ghana : Root and Tuber Improvement Programme
Peeling cassava roots in preparation for making Gari. This activity is not mechanised
and is mostly done by women
IFAD photo by Andrew Westby

Republic of Ghana
Root and Tuber Improvement Programme (RTIP)
Loan N° 461-GH
Interim Evaluation

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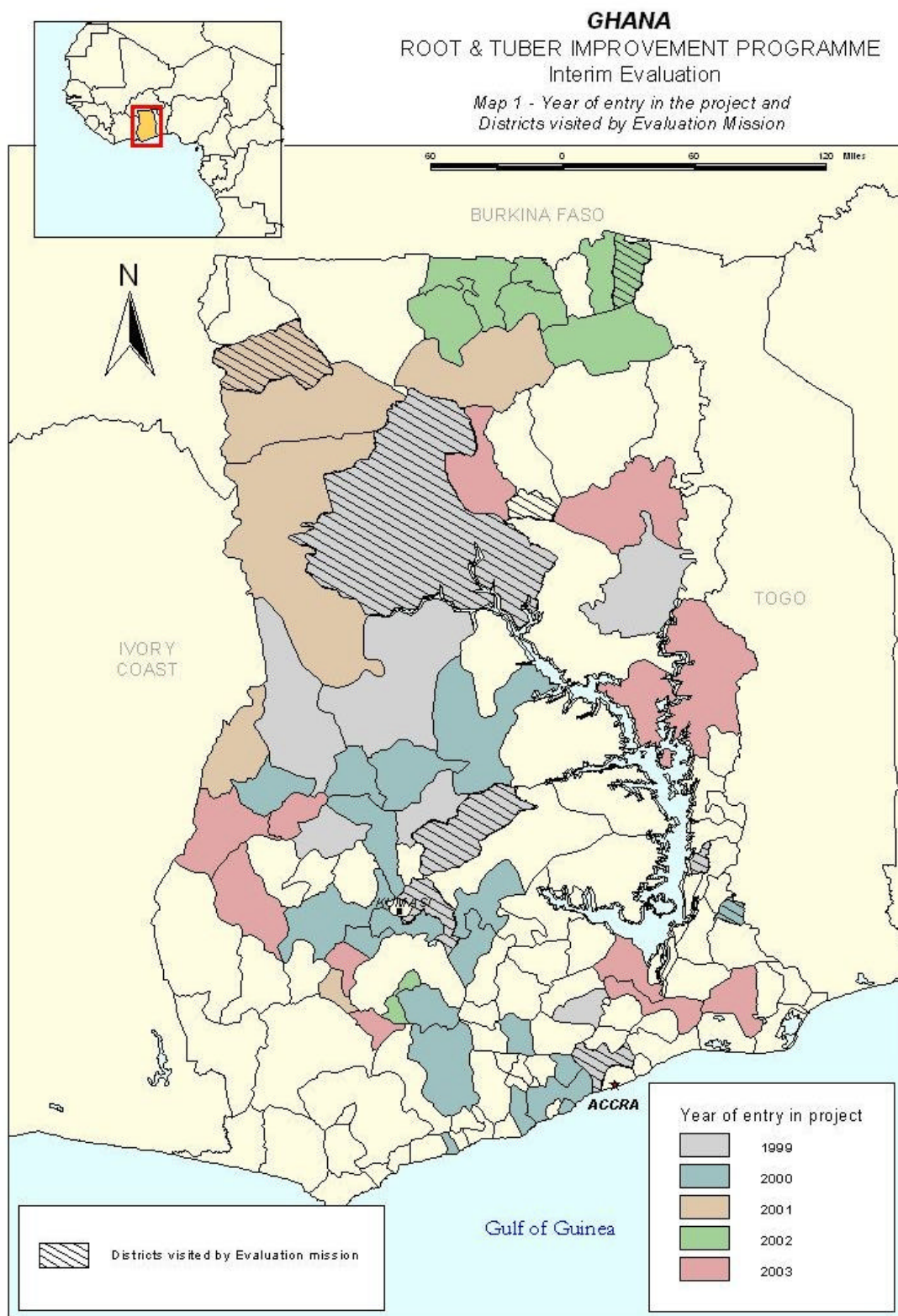
Exchange Rates

Local Currency	=	Cedi (GHC)
USD 1.00	=	9,002.00 Cedi (GHC)
Cedi (GHC) 1.00	=	0.000111086 USD

Abbreviations and Acronyms

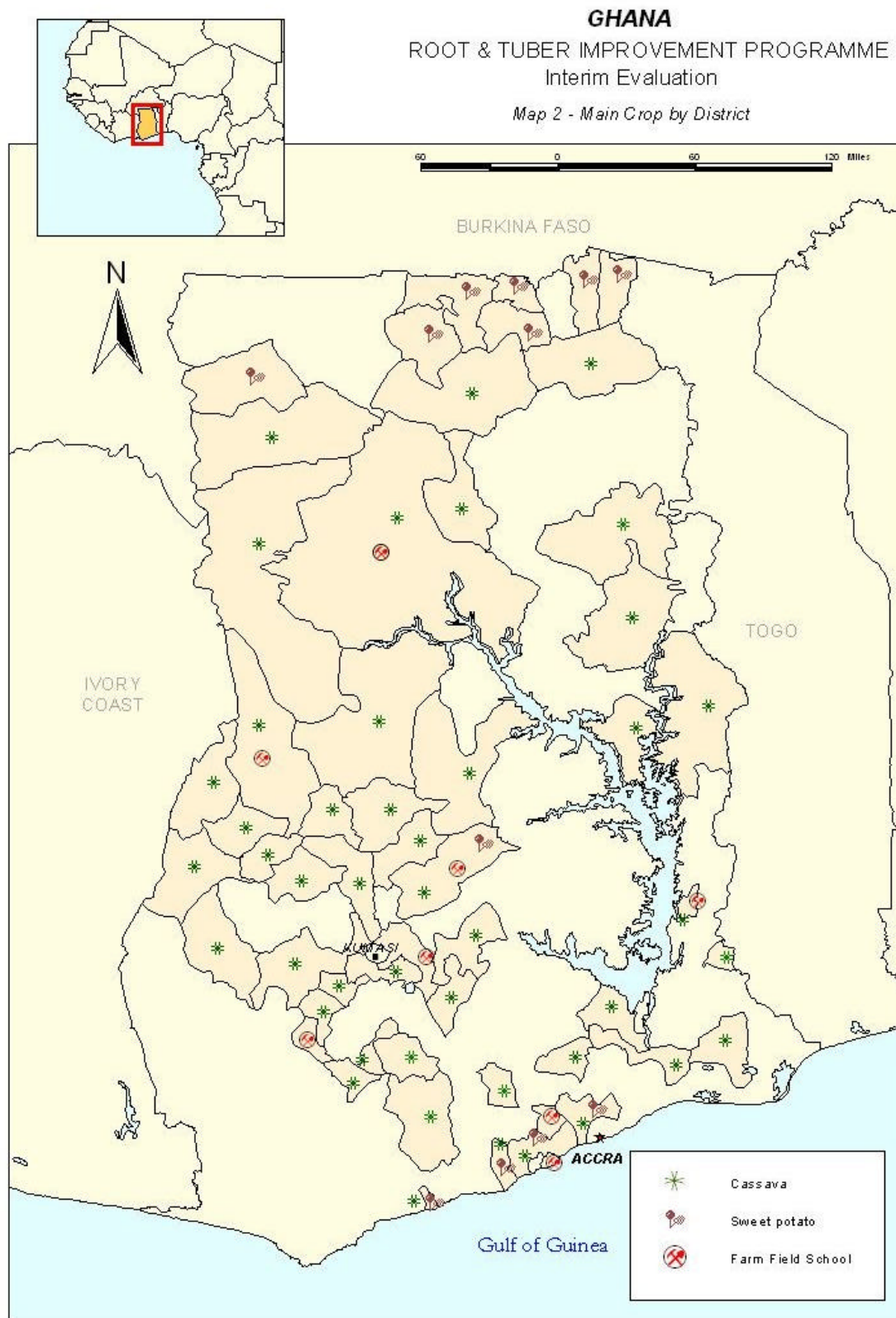
ACMV	African Cassava Mosaic Virus
AEA	Agricultural Extension Agent
AEA	Agricultural Extension Agents
AESD	Agriculture Engineering Services Division
ARC	Adaptive Research Component
ARS	Agricultural Research Station
AWPB	Annual Work Plan and Budget
BAS	Beneficiary Assessment Study
BNARI	Bio-Agricultural Nuclear Agricultural Research Institute
CAD	Cassava Anthracnose Disease
CBB	Cassava Bacterial Blight
CBO	Community Based Organisation
CGM	Cassava Green Mite
CPM	Country Portfolio Manager
CRI	Crops Research Institute
CRO	Crop Research Institute
CSD	Crop Services Division
CSIR	Council for Scientific and Industrial Research
CSM	Community Support and Mobilisation
DAES	Department of Agricultural Extension Services
FAO	Food and Agriculture Organisation of the United Nations
FFS	Farmer Field School
FRI	Food Research Institute
GFO	Group Formation Officer
GLDB	Grains and Legumes Development Board
GRATIS	Ghana Regional Technology Industrial Service
IEC	Information, Education and Communication Campaign
IFAD	International Fund for Agricultural Development
IITA	International Institute of Tropical Agriculture
IPM	Integrated Pest Management
ISM	Implementation Support Mission
KNUST	Kwame Nkrumah University of Science and Technology
LGB	Larger Grain Borer
M&E	Monitoring and Evaluation
MIS	Management Information System
MOFA	Ministry of Food and Agriculture
MOU	Memorandum of Understanding
MTR	Mid Term Review
NARP	National Agricultural Research Project
NGO	Non Governmental Organisation
NPC	National Programme Co-ordinator
NPSC	National Programme Steering Committee
NVRC	National Varietal Release Committee
PAR	Project Appraisal Report
PCO	Project Co-ordination Office
PGRC	Plant Genetic Resources Centre
PMIT	Planting Materials Inspection Team

PMMD	Planting Material Multiplication and Distribution
PMO	Planting Materials Officer
PPM	Post-Production and Marketing
PPMED	Policy, Planning, Monitoring and Evaluation Department
PPRSD	Plant Protection and Regulatory Services Directorate
PSI	President's Special Initiative
PVB	Plant Varietal Breeding
PY	Project Year
RTIP	Root and Tuber Improvement Programme
SARI	Savannah Agricultural Research Institute
TOR	Terms of Reference
TTL	Task Team Leader
VIP	Village Infrastructure Project
WB	World Bank
WIAD	Women in Agricultural Development



Source: IFAD

The designations employed and the presentation of the material in this map do not imply the expression of any opinion whatsoever on the part of IFAD concerning the delimitation of the frontiers or boundaries, or the authorities thereof.



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Republic Of Ghana
Root And Tuber Improvement Programme
Interim Evaluation

Agreement at Completion Point¹

I. INTRODUCTION

1. The Root and Tuber Improvement Programme, (RTIP) became effective in January 1999 and was scheduled to close in December 2004. It was extended until Sept. 2005. An Interim Evaluation of RTIP was undertaken during the period May-November 2003. To oversee the evaluation process a group of individuals were identified to make up a Core Learning Partnership². They included individuals associated with the RTIP from government, scientific institutions, civil society, and the international institutions associated with the Programme. These individuals reviewed the Approach Paper that was drafted to orient the evaluation prior to its start-up. Most met with the evaluation team before the field work in late July – early August 2003 and they participated in a de-briefing and discussion with the team upon completion of the field work. The Office of Evaluation subsequently provided them with a copy of the draft report of the Interim Evaluation for review and comments. It then facilitated the conclusion of this Agreement at Completion Point.

2. The purpose of the Agreement at Completion Point is to document the recommendations from the Interim Evaluation Report that the partners are willing to support and to record the actions that will be taken in order to implement those recommendations in future related activities and investments.

II. MAIN FINDINGS

3. The Evaluation team found that RTIP has accomplished a number of its original objectives and made some important contributions to the development of the crops that it was designed to support. In particular, it successfully created a nationwide system for the multiplication and dissemination of planting material – widely distributing three improved varieties of cassava. Five varieties of sweet potato were multiplied and distributed in zones 1 and 5, and seven desirable local cultivars were sanitized and distributed. A further five varieties of cassava were released by the programme and are in early stages of multiplication. It has undertaken research and development for more new varieties of cassava and sweet potato that are soon to be released. It has developed and disseminated successful pest management practices, including methods to control *Imperata cylindrica* and *Mononychelus tanajoa*. It has set up seventeen Farmer Field Schools and trained more than 1 500 agricultural service staff. The recorded number of farmers who have accessed new materials was about 105 000 at the time of the evaluation. If those farmers that adopted but have not been recorded as such were counted, the number would be considerably higher. RTIP is likely to reach its targeted 720 000 farmers by the end of the project, all other factors remaining equal. At this level of outreach, the cost of the project would be a low USD 14 per beneficiary.

¹ This agreement reflects an understanding among partners to adopt and implement recommendations stemming from the evaluation. The agreement was formulated in consultation with the members of the Core Learning Partnership (CLP).

² The Core Learning Partnership was composed of Mr. Kwaku Owusu Baah, Chief Director, MOFA; Mr. J. A. Poku Director, Crop Services Directorate MOFA (replacing Mr. Francis Ofori); Mr. C. D. Anyomi, External Resources Mobilisation, Ministry of Finance; Mr. Owusu-Bennoah, Acting Director General, CSIR; Mr. Akwasi Adjei Adjekum, National Programme Coordinator; Mr. J.N.O. Azu, Programme Technical Advisor and Deputy Country Director, Opportunities Industrialisation Centre, (OIC); Mr. Yeboah Asuama, Farmer, Wenchi District; Ms. Habiba Yusif, District Development Officer, Bibiani District; Mr. William M. Wiafe, Deputy Regional Director, MOFA; Ms. Patience Mensah, Task Team Leader, World Bank; Mr. Mohamed Manssouri, Country Programme Manager; Mr. Robert Asiedu, Plant Breeder, International Institute for Tropical Agriculture (IITA); Mr. Douglas Wholey, Technical Advisor (Agronomy), IFAD; Mr. Alessandro Meschinelli, Technical Advisor (Research), IFAD; Mr. Nebambi Lutaladio, FAO.

4. Two major areas of RTIP work were found by the evaluation team to be in need of improvement. Firstly, attention to the poverty reduction goal of RTIP was inadequate. If a second phase of RTIP is to benefit from IFAD-financing, it should focus more systematically on how it can contribute to reducing rural poverty. This will mean explicitly choosing those activities and investments in root and tuber crop production that will lead to increased incomes or increased food security for poorer households. Secondly, RTIP should address with vigor the wide range of issues that relate to the post harvest phase of root and tuber crop production.

III. RECOMMENDATIONS FROM THE INTERIM EVALUATION AGREED UPON BY CORE LEARNING PARTNERS

Before project closure

5. On the basis of the evaluation findings and conclusions, the IFAD Office of Evaluation recommended a number of detailed actions for the remainder of the RTIP implementation period. The implementation of these recommendations will be the responsibility of the Project Coordination Office.

6. Recommendation of the Office of Evaluation: Given the likely continued difficulties of farmers in marketing surplus output in local markets if the distribution of planting materials is continued at the current pace, it is recommended to reduce arrangements with secondary and tertiary farmers to a minimum level, except where there is a high demand for low-price cassava for large-scale processing. Under the current circumstances, this applies only to farmers supplying the Ayensu Starch Company. In other areas, normal farmer to farmer diffusion patterns should be sufficient for further dissemination of planting material, and the ordinary assistance provided to farmers through the extension service should fully suffice to assist farmers who demand new varieties.

7. Actions and Responsibilities Agreed to by the Partners: The partners did not agree to adopt this recommendation. Instead, they agreed that the Programme Coordination Office will have full flexibility to continue the distribution of planting materials at the current pace in the light of its expectations about future trends in prices, demand for outputs and the continuing need to disseminate new varieties.

8. Recommendation of the Office of Evaluation: RTIP should undertake to complete building works on the insectaries. In connection with the IPM component it should also distribute predators of Large Grain Borer in known hotspot areas. RTIP should also commission a study of the economic impact of the current biological control before designing future IPM investments.

9. Actions and Responsibilities Agreed to by the Partners:

- The Programme Coordination Office will ensure completion of building works on the insectaries;
- The Programme Coordination Office will ensure distribution of predators of LGB in known hotspot areas;
- The Programme Coordination Office will commission a study of the economic impact of the current biological control methods.

10. Recommendation of the Office of Evaluation: While the varietal release programme continues, there should be increased emphasis, even in on-going research programmes on financial and socio-economic analyzes of proposed interventions. In addition, production of extension materials needs to be stepped up and, if possible, a web-site should be commissioned to increase the availability of information generated to eventually include relevant information from other components.

11. Actions and Responsibilities Agreed to by the Partners:

- The Programme Coordination Office will emphasize financial and socio-economic analyzes of proposed interventions in on-going research programmes;
 - The Programme Coordination Office will step up production of extension materials and will increase availability and exchange of information generated from all components.
12. Recommendation of the Office of Evaluation: To improve RTIP operations generally and to prepare for the next phase investment, RTIP should undertake a cost-benefit analyzes of alternative approaches to processing, comparison of the best set-up and scale for current village-based processing options and guidelines for processors. The same applies for assessments of markets, demand and prices for root and tuber crops and products.
13. Actions and Responsibilities Agreed to by the Partners:
- The partners agreed that the Programme Coordination Office will undertake a cost-benefit analyzes of current approaches to processing, comparing the best set-up and scale for various village-based group and individual processing options including guidelines for processors;
 - The partners proposed and agreed that the Programme Coordination Office will undertake a tracer study of those individuals that have been trained by RTIP in processing techniques in order to determine what was the impact of the training that was conducted and what follow up may be required to that training.
 - The partners agreed that the Programme Coordination Office will begin to undertake assessments of markets, demand and prices for root and tuber crops and products.
14. Recommendation of the Office of Evaluation: Support to groups under the community support and mobilisation component should be concentrated on processing groups and addressing their specific requirements. In addition, in order to support the PSI further, RTIP should respond to the demand for support of groups collaborating with the Ayensu Starch Company.
15. Actions and Responsibilities Agreed by the Partners:
- The partners agreed that the Programme Coordination Office will concentrate work of community support and mobilisation component on processing groups;
 - The partners agreed that the Programme Coordination Office will respond to demand for support from groups collaborating with semi-industrial and industrial users of cassava including the Ayensu Starch Company.
16. Recommendation of the Office of Evaluation: There should be two officers in charge of the post-production and marketing component. Those staff should develop a work plan in collaboration with colleagues working in adaptive research and community support, beginning with efforts described below pertaining to an eventual phase II.
17. Actions and Responsibilities Agreed by the Partners:
- The partners agreed to seek more human resources for the post-production and marketing component. Due to budgetary concerns, partners agreed to recruit one person and to consider adding more resources in future;
 - The partners agreed to develop work plans for post-production marketing with colleagues working in adaptive research, community support and extension that will begin efforts – including staff training - for implementation of recommendations for Phase II.
18. Recommendation by the Office of Evaluation: The current M&E system would benefit from a thorough review to see where the collection, generation and processing of data on physical and financial progress can be reduced to the bare essentials. It should also assign an additional staff member full time to implement the basic M&E functions that are retained. It should review monitoring

of current log frame indicators of RTIP performance and give greater thought to developing the work it has begun on evaluating impact at the household level and the use of participatory means to do so.

19. Actions and Responsibilities Agreed by the Partners:

- The partners agreed to review the current M&E system to reduce collection, generation and processing of data on physical and financial progress to the bare essentials. They did not agree to recruit one M&E assistant to help implement the system;
- The partners agreed to review current monitoring of RTIP log frame indicators to develop work begun on participatory evaluation of impact at the household level;
- The partners proposed and agreed to consider how to link RTIP M&E work to the regional M&E officers and look for ways to strengthen the capacity of the latter to collect and analyze data in the second phase.

For future investments

20. The results of the evaluation support a second phase investment to follow up and consolidate investments and activities that have been undertaken through RTIP to date. In relation to such an eventual investment by IFAD, and to future such investments by the Government of Ghana, it makes the following recommendations for the orientation of such investments.

Re-focus on increased incomes & food security

21. Recommendation of the Office of Evaluation: RTIP's success in making available improved planting material, leading to increased output levels has been an excellent first step toward reaching poor farmers with new technologies, however still more needs to be done to result in increased income and food security for the wide group of beneficiaries that RTIP was intended to reach. Further, IFAD investments in the development of root and tuber crops in Ghana should maintain those ultimate goals, explicitly designing every component and activity to contribute to their achievement.

22. Actions and responsibilities agreed by the Partners: The partners agreed that *IFAD and the Government of Ghana* will more explicitly direct future investments in root and tuber crop development to achieve the goals of increased incomes and increased food security.

Re-think what crop development investments most help the poor

23. Recommendation by the Office of Evaluation: The evaluation found that there is evidence that producers of sweet potatoes and secondary multipliers increased their incomes. However, it found no clear evidence that the incomes of poor farmers had increased as a result of increased output levels achieved when using new varieties distributed by RTIP. This lack of income increases is attributed by the evaluation to the increased production costs associated with the new varieties, low output prices, and the limited options for poor farmers in terms of processing, marketing and consumption. Therefore, it recommends that designers of future investments like these that are intended to reduce poverty carefully reconsider this programme's assumptions about how crop sector development can benefit poor rural households. For example, assumptions about the mix of crops produced by poor farmers in drier areas should be reconsidered and thought be given to whether they can achieve better mixes of yam, cassava, and sweet potato crops.

24. Actions and Responsibilities agreed by the Partners:

The partners agreed that *IFAD and the Government of Ghana*, prior to undertaking further joint investments in the root and tuber crop sector, will study where RTIP and others have made the most significant progress in improving the livelihood systems of the poor rural households with respect to food security and income. They will use these findings in the design of the second phase of RTIP.

Make research and extension more responsive to the needs of the poor

25. Recommendation by the Office of Evaluation: Agricultural research and farmer field schools, or other extension activities, should be demand-led, not programmed at project appraisal. Farmer priorities must be periodically ascertained in a systematic way. They must then be given greatest weight alongside technical and agricultural policy considerations.

26. Actions and Responsibilities Agreed by the Partners:

- The partners agreed that *The Ministry of Food and Agriculture and IFAD*, will include in the design of a second phase for RTIP, procedures for field staff to systematically ascertain the views of poor farmers, using participatory approaches for the analysis of their constraints and potential and ranking of their priorities. These procedures will be developed in harmony with the work of RELC in each region.
- The partners agreed that *The Ministry of Food and Agriculture*, in the second phase of RTIP and other similar poverty reduction efforts, will identify and rank research topics and for inclusion on research agendas using, among others, the following criteria: i) prevalence of the constraint or opportunity to be addressed among relatively poorer farmers; ii) type and level of benefits expected to accrue; iii) how benefits would accrue; and, iv) to whom benefits would accrue.
- The partners agreed that *The Ministry of Food and Agriculture*, in the second phase of RTIP and other similar poverty reduction efforts, will prepare training courses and materials to transfer knowledge, including research results, according to the priorities ranked highest by poorer farmers, with due regard to larger technical and policy issues.

Be more selective in multiplication and distribution campaigns

27. Recommendation by the Office of Evaluation: Overall a more selective approach to multiplying and disseminating the recently released cassava varieties should be taken. Prior to defining that approach, an analysis should be done of the costs of multiplication. Better analysis is also required of how to better match varieties to farmers and locations, taking into consideration factors such as farmer needs and preferences, storage and processing options, the absorption capacity of local markets and alternatives to marketing locally. Large scale campaigns for the multiplication and dissemination of improved varieties should be used only where the consequences of their adoption have been carefully thought through and there is reasonable certainty that assumptions about benefits will hold true. This would be the case, for example, in areas where the government PSI initiative is active and the local market can absorb a large supply response coming from adoption of high-yielding varieties.

28. Action and Responsibilities agreed by the Partners:

- The partners agreed that *The Ministry of Food and Agriculture*, prior to the formulation of a second phase of RTIP, will analyze the financial and economic costs of RTIP-created multiplication and dissemination system.
- The partners agreed that *The Ministry of Food and Agriculture*, in the implementation of the second phase of RTIP and other similar efforts, will analyze how to better match varieties selected for dissemination to farmers and locations, taking into consideration i) needs and preferences of the farmers who are targeted; ii) storage and processing options; iii) the absorption capacity of local markets; and, iv) alternatives to marketing locally.

Farmer field schools – up or out?

29. Recommendation by the Office of Evaluation: Farmer Field Schools are successful, but there are too few of them to reach the number of farmers and make the nationwide impact that RTIP seeks. They may represent a good option for farmer training and extension. However, before investing in their replication and up-scaling throughout the country, a study should be undertaken to compare the

relative costs and benefits of Farmer Field Schools per farmer beneficiary versus normal extension practices and selected new approaches being carried out in some districts such as “participatory technology development and extension”. The programme can then make an informed choice about whether to replicate and up scale the Farmer Field School approach and set down a rationale and strategy for the transfer of knowledge to farmers via training and other means.

30. Action and Responsibilities agreed by the Partners:

- The partners agreed that *The Ministry of Food and Agriculture*, prior to the formulation of a second phase of RTIP, will commission a study to compare the relative costs and benefits per farmer beneficiary of Farmer Field Schools versus normal extension service practices at the district level.
- The partners agreed that *The Ministry of Food and Agriculture and IFAD*, in the formulation of the second phase of RTIP, will include a rationale and strategy for the transfer of knowledge on root and tuber crops to farmers via training and other means that includes: total number and type of farmers to be targeted, amount and level of knowledge to be transferred, time frame, human and financial resources required, and expected benefits.

Support entire production chain – research station to market

31. Recommendation: Future investments by the Government of Ghana in support the development of particular crops, as in RTIP, should be designed to support the entire chain of production, with more balanced investments in each link of the chain.

32. Action and Responsibilities agreed by the Partners: *IFAD*, in the design of the second phase of RTIP, will propose activities to promote active collaboration between technical staff in various MOFA Divisions and staff from other responsible ministries to share knowledge and pool resources on selected product lines or outputs, through task forces or other means.

Shift emphasis from beginning to end of chain

33. Recommendation by the Office of Evaluation: Future investments for reducing poverty through investment in root and tuber crops should shift emphasis from research and production to processing and marketing.

34. Action and Responsibilities agreed by the Partners: The partners agreed that *IFAD, the Government of Ghana and the Ministry of Food and Agriculture*, in the design and implementation of the second phase of RTIP, will identify and make available increased amounts of expertise and resources for investments to develop the processing and marketing of root and tuber crops in Ghana.

IV. ADDITIONAL RECOMMENDATIONS FROM CORE LEARNING PARTNERS AGREED UPON FOR FUTURE INVESTMENTS

Improve institutional arrangements for programme management and implementation

35. Recommendation by the Partners: Create a social science capacity at a senior level, (by adding a new post, or by substituting or changing requirements for an existing post) within the Programme Coordination Office to address the issues of targeting, communities and farmer organisations, research priority setting, and post-production issues as well as the needed improvements in M&E and impact assessment.

36. Recommendation by the Partners: Establish officers by zones in the country, as in other IFAD projects, to facilitate management and outreach, for the northern and southern sectors.

37. Recommendation by the Partners: The arrangements for the function and location of the Financial Controller, now posted in Accra, should be discussed with the formulation team during the design of RTIP phase II, together with other ways to improve the design of financial management practices.

38. Recommendation by the Partners: Efforts to improve RTIP monitoring and evaluation and its contribution to programme management should include linking RTIP up with regional M&E officers and strengthening their staff and facilities to fulfil RTIP support functions.

39. Action and Responsibilities agreed by the Partners:

- The partners agreed that *IFAD, the Government of Ghana and the Ministry of Food and Agriculture*, in the design and implementation of the second phase of RTIP, will require the appointment of at least one senior social scientist amongst the PCO staff. Such a person will be made responsible for ensuring that the Programme addresses issues of targeting, research priority setting, and post-production issues as well as the needed improvements in M&E and impact assessment.
- The partners agreed that *IFAD, the Government of Ghana and the Ministry of Food and Agriculture* will establish zonal offices.
- The partners agreed that *IFAD, the Ministry of Food and Agriculture, and the Ministry of Finance and Economic Planning*, will discuss with the formulation team for the second phase of RTIP the arrangements for the function and location of the Financial Controller of RTIP, as well as other ways to improve the design of financial management practices and propose concrete measures to improve financial management practices in RTIP's next phase.
- The partners agreed that *IFAD, the Government of Ghana and the Ministry of Food and Agriculture*, in the design of RTIP phase II, would foresee actions to improve RTIP monitoring and evaluation and its contribution to programme management including linkages with regional M&E officers and strengthening of regional staff and facilities to fulfill RTIP support functions.

Tackle problem of soil fertility depletion

40. Recommendation by the Partners: With continually growing demand and further improvements in processing and marketing it is expected that root and tuber production levels will increase in the future. Soil fertility research should be undertaken with better links between the Programme, producers and researchers.

41. Action and Responsibilities agreed by the Partners: The partners agreed that *IFAD, the Government of Ghana and the Ministry of Food and Agriculture*, in the design and implementation of the second phase of RTIP, will seek to place more emphasis on soil fertility and seek to form stronger links between producers and researchers on areas of soil fertility and other areas of major concern to poor producers.

Explore new possibilities for rtip support to secondary multiplication and distribution of improved planting material

42. Recommendation by the Partners: In order to promote the development of the private sector in the production of planting material and ensure the maintenance of planting material quality standards, the second phase of RTIP will study possible areas for greater private sector involvement in its production while facilitating the access of tertiary farmers to materials from secondary multipliers through agricultural extension services and other means.

43. Action and Responsibilities agreed by the Partners: The partners agreed that *IFAD, the Government of Ghana and the Ministry of Food and Agriculture*, in the design and implementation of

the second phase of RTIP, will study possible areas for private sector involvement in the production of planting material. It will also make explicit provisions for helping tertiary farmers to access the improved materials produced by secondary multipliers.

Step up work on seed yams, coco-yams fra-fra potatoes and sweet potatoes

44. Recommendation by the Partners: The heavy concentration on cassava during RTIP should be counter-balanced by intensified work on yams, coco-yams, fra-fra potatoes and sweet potatoes in the future. These crops are also widely grown and hold a potential for raising the household food security conditions of the rural poor that should be exploited.

45. Action and Responsibilities agreed by the Partners: The partners agreed that *IFAD, the Government of Ghana and the Ministry of Food and Agriculture*, in the design and implementation of the second phase of RTIP, will significantly increase the resources and attention dedicated to root and tuber crops other than cassava.

46. This Agreement was concluded on 13 May 2004 in Kumasi amongst the following partners to the evaluation:

Mr. Kwaku Owusu Baah, Chief Director, MOFA
Mr. J.A. Poku, Director, Crops Services Directorate, MOFA
Mr. C. D. Anyomi, Director, External Resources Mobilisation, Ministry of Finance and Economic Planning
Mr. Felix Amoako, Desk Officer IFAD, External Resources Mobilisation, Ministry of Finance and Economic Planning
Mr. Akwasi Adjei Adjekum, National Programme Coordinator, RTIP
Mr. J.N.O. Azu, Programme Technical Advisor and Deputy Country Director, OIC
Mr. Yeboah Asuama, Farmer Wenchi District
Ms. Habiba Yusif, District Development Officer, Bibiani District
Mr. William M. Wiafe, Deputy Regional Director, MOFA
Mr. Robert Asiedu, Plant Breeder, International Institute for Tropical Agriculture
Ms. Patience Mensah, Task Team Leader, World Bank
Mr. Mohamed Manssouri, Country Programme Manager

Republic of Ghana
Root and Tuber Improvement Programme
Interim Evaluation

EXECUTIVE SUMMARY

1. The Root and Tuber Improvement Programme, (RTIP) became effective in January 1999 and is scheduled to close in December 2004. IFAD and the Government of Ghana are considering a second phase for this project. This evaluation of RTIP was undertaken at the request of the IFAD Africa I Division as a precondition for the formulation of any second phase project. It took place over the period May – November 2003. The evaluation team conducted fieldwork in late July and early August, including visits to 11 districts and meetings with stakeholders in areas of RTIP activities as well as in Accra, Kumasi and Rome. Further, it drew upon a Beneficiary Assessment Study (BAS), commissioned by RTIP.³
2. The evaluation team used the IFAD Office of Evaluation Methodological Framework for Project Evaluation that emphasises consultation and participation of partners with the expectation that the knowledge they acquire will contribute to their improved performance in future. For this, the Core Learning Partnership (see Footnote 1) was established to guide the work. This group reviewed and cleared an Approach Paper that outlined the evaluation methodology, key questions, and calendar.⁴ It held briefings and de-briefings with the evaluation team prior to and following fieldwork. It will review the draft evaluation report and meet to conclude an agreement among partners, known as the Agreement at Completion Point (ACP).
3. The project rationale justified an RTIP focus on root and tuber crops because of their importance in household food security, because they are grown by the poorest segment of the population, because their development would help diversify agricultural sector development, and because supporting them would channel more agricultural sector resources to the smallholders who produce, process and market them. RTIP was designed to be a nationwide project, referred to as a programme that targeted some 720 000 resource poor farmers, with priority to be given to women.
4. The overall objective of RTIP was to enhance food security and improve incomes of resource poor farmers. Originally this was to be done through five components: i) multiplication and distribution of improved material ii) integrated pest management; iii) adaptive research; iv) community support and mobilisation, and, v) programme management and coordination. A sixth component for post-production and marketing was added subsequent to a project start-up workshop in August 1998. The Ministry of Food and Agriculture, Crop Services Division, was assigned responsibility for RTIP implementation and the World Bank was appointed as the cooperating institution for project supervision and implementation support. Numerous research institutions, universities, non-governmental organisations and other agencies were assigned responsibilities for implementation. Liaisons with the International Institute for Tropical Agriculture (IITA) and with other IFAD projects in Ghana were also important to project implementation.
5. One major policy change, the President's Special Initiative on Agribusiness/Cassava, (PSI) affected the RTIP implementation environment. An agreement was concluded between PSI and RTIP whereby RTIP was to supply improved planting material to cassava farmers providing inputs to PSI starch factories. It raised awareness about cassava and increased demand for RTIP planting materials to the benefit of RTIP. However, the considerable efforts that RTIP made to respect its PSI agreement detracted from efforts to realise other elements of its programme and PSI's different approach sometimes confused farmers.

³ This study was done by the Ghana Institute for Management and Public Administration, (GIMPA).

⁴ See Appendix 1

6. The evaluation found that the rationale for RTIP was very relevant for rural poverty reduction in the Ghanaian context at the time that RTIP was designed, as were RTIP objectives. The components that made up RTIP were also relevant to achieving those objectives. However, the original omission of post-production and marketing activities from the original programme was a major flaw in its design. The component subsequently added to cover this area was inadequate, as was the priority afforded by the PCO. This has been the most important factor that has kept RTIP from reaching its overall objectives so far.

7. Looking at RTIP results, the planting materials multiplication system established an efficient three tier system for multiplication and distribution of four improved cassava varieties in 50 districts between 1999 and 2002. The recorded number of farmers who have accessed new materials is about 105 000. If those farmers that have accessed improved varieties but have not been recorded were to be included, the number would be considerably higher. For sweet potatoes, two improved varieties have been multiplied and distributed to a total of some 14 500 farmers. Attention to yam and cocoyam by RTIP has been very limited, with no significant achievements to date in the multiplication and distribution of improved varieties of these crops. This was largely due to the fact that there were no improved varieties available to multiply and distribute. Actions that were undertaken included promotion and multiplication of two highly valued local yam cultivars as well as a campaign for propagation of coco-yam late in the programme.

8. The component for adaptive research served as a vehicle for undertaking more than 60 research projects submitted by Ghanaian researchers in more than a dozen different government and academic institutions on agronomic areas as provided for in the RTIP appraisal report. During the course of implementation RTIP added investigation into integrated pest management, post production and marketing to address newly arising issues. Among this component's results are the release of five new cassava varieties, upcoming releases of sweet potato, yam, cocoyam and more cassava varieties currently in the pipeline, recommended practices for control of *Imperata cylindrica*, control of tuber rot and options for maintaining soil fertility. Overall, the activities have contributed significantly to the knowledge base in Ghana on root and tuber crops. However, the component limitations included its approach to determination of research priorities, inadequate consideration of socio-economic factors in the selection and evaluation of varieties and practices to be pursued for development, limited dissemination of research results, weak links with extension, and minimal integration with the workings of the PCO and other components.

9. In the IPM component results have been below target due to delays in construction of two of the three planned insectaries. However, predators furnished by the RTIP appear to have led to the successful control of the Green Mite *Mononychelus tanajoa* in seven of the ten regions of Ghana. Efforts to control Larger Grain Borer were made on a limited scale, with correspondingly limited results to date. Seventeen Farmer Field Schools, established in fifteen districts, served as vehicles for IPM and basic root crop cultivation techniques. The evaluation team considers the FFS to have been successful, but arguably inadequate in number and too resource intensive, reaching a total of only about 600-700 farmers in 20% of the 76 districts currently in RTIP. Further, FFSs had weak links with the adaptive research component resulting in missed opportunities to the detriment of both researchers and beneficiaries.

10. In the Community Support and Mobilisation component, RTIP has formed some 9 800 groups, about 96% of the groups were for production, 3% processing and less than 1% marketing. By and large groups were formed for specific temporary purposes. The evaluation team considers that groups formed have served as effective tools for the distribution of planting material and transmission of knowledge on improved cultivation practices. However, according to the BAS only 3% of respondents liked the group formation efforts and an estimated 80% of groups formed were either non-functional or disintegrated at the time of the study in July 2003. Processing and marketing groups, often based on pre-existing relationships among members, were more cohesive. Other efforts funded under this component included upgrading of government and NGO staff skills in outreach to beneficiaries, training of beneficiaries in improved crop utilisation, strengthening links to private sector processors, and an information, education and communication campaign. These were implemented roughly as anticipated, but suffered from a lack of a vision or overall strategy pulling together these disparate activities in a unified effort with a clearly defined purpose.

11. Under the post production and marketing component, RTIP collected information related to storage, processing and utilisation of roots and tubers, but stopped short of fully exploiting that information. Similarly, a study of marketing issues was undertaken. Improved cassava graters, stoves for roasting and screw presses were developed. Training modules were developed in cassava processing and in use of sweet potatoes. They were delivered to more than 1 500 people including MOFA staff, small-scale processors, bakers, and farmers. However, the PCO did not secure the staff and technical expertise to give this component the due importance. Cooperation between RTIP and the IFAD-funded Village Infrastructure Project in this field never materialised, despite being formalised in a Project Working Agreement in November 1998 as a condition of loan effectiveness. The lack of attention by MOFA and RTIP's PCO to the resolution of these problems is surprising given the seriousness of post harvest and marketing issues facing the farmers.

12. Results and performance in the Programme Management component were well above average, rising to the challenge of the design of this ambitious nationwide project. The PCO succeeded in creating working relationships with numerous different organisations and institutions throughout the country. It made substantial achievements in plant multiplication and distribution, integrated pest management and adaptive research. By and large, the PCO administration of the implementation of physical and financial activities, including disbursement, accounting and reporting, has also been good. The PCO showed weaknesses in two respects. Firstly, it tended to focus more on the technical and scientific sides of what was needed to achieve its overall goal, shying away from fully dedicating itself to some of the harder to solve, but essential issues on the economic and social side of the investment. Secondly, RTIP management appears to have allowed its energies to become fully absorbed in the logistics and practical details of achieving the physical and financial targets. Given the size and complexity of the task this is understandable. Nonetheless, it took insufficient time to consider to whether RTIP's implementation was leading to the desired longer term outcomes and impact.

13. RTIP, to its credit, has been reasonably effective in reaching the specific objectives of its individual components, even if there have been shortcomings and weaknesses in each component as alluded to in the descriptions of component results and performance above. It has concentrated most of its efforts on and been most effective in the planting material multiplication and distribution component, while it has been least effective in the added-on component for post-production and marketing.

14. It is still somewhat early to judge how effective RTIP in its entirety will be in achieving at completion its overall goals of enhanced food security and improved incomes of resource poor farmers. The RTIP log frame targets identified three indicators for achieving its goals: 720 000 beneficiaries reached; calorie consumption during lean season in beneficiary households increased by 20%; incomes in beneficiary households increased by 15%. RTIP records show it having reached 120 000 households to date. Nonetheless, the evaluation team considers that it may well reach close to 720 000 households by the end of the project. RTIP does not have records on income or calorie

consumption that would allow similar assessments of whether it will be effective in reaching its targets in those areas.

15. Information collected by the evaluation team and drawn from the BAS indicate that there are very likely to have been income increases above 15% for the households of the more than 2 000 farmers who have participated in RTIP as secondary multipliers. In addition, the 14 500 sweet potato growers who adopted RTIP distributed varieties had output increases and faced ready markets are also very likely to have realized such income gains. However, it appears that the majority of ordinary farmers who adopted improved cassava varieties will have had little if any income increases.

16. Based on RTIP data the evaluation team considers that ordinary cassava farmers have achieved yield increases of up to 40%. For this reason, despite the absence of data on calorie consumption, the team considers that the food security of participating households has improved. Yet increased yields have not translated directly into increased incomes for ordinary farmers for several reasons. Firstly, revenue from cassava occupies a relatively limited share of total household revenue. Furthermore, there has been local inflation of 65% during the period January 2001 to May 2003, increased production costs associated with RTIP-introduced practices and varieties, relatively lower prices for the RTIP varieties, and a decline in cassava prices generally – most likely due to the overall increase in output levels in local markets as a result of RTIP and PSF⁵.

17. Notwithstanding the fact that RTIP's ultimate impact on the household income of resource poor cassava farmers remains to be seen, there are some indications that the investment will prove to have been relatively efficient in terms of its overall benefits to Ghana and the Ghanaian economy. Roughly speaking, the evaluation team estimates that there have been food security benefits for some 80 000 producer households (out of about 120 000 reached) and income benefits for some 16 000 households. Other, observable economy-wide benefits to-date from the RTIP investment of USD ten million, (about USD 14 per beneficiary household, based on the total number of beneficiaries targeted) include improved work processes and systems related to support of these crops by MOFA and other agricultural sector institutions. There have been lower consumer prices for root and tuber products. Further, RTIP has fostered a nascent potential for cassava exports, for low cost cassava supplies to agro-processing industries and for decreased dependency on imported wheat flour. The utilization of project facilities and services is high. On the whole the standards of RTIP services have been high despite some variation by component. Actual costs or expenditures have corresponded, for the most part, to appraisal estimates and there have been no significant implementation delays.

18. The evaluation assessed the rural poverty impact of RTIP in the six standard domains of impact set by IFAD: financial and physical assets, human assets, social capital, food security, environment and institutions and policies. The evaluation team rated RTIP overall impact on beneficiaries as modest.

19. So far the project has had its most widespread impact in the domain of food security. It is considered very likely that food security improvements will spread as RTIP reaches more households and that the changes in food security will be sustained given RTIP's impact on the farming technology and practices.

20. RTIP also made a positive impact in the domain of human assets in terms of access to information. The information, education and communication campaign of RTIP, including a national media campaign, training activities, and Farmer Field Schools have all contributed to achievement of this impact by making knowledge of the production, uses, processing and marketing of root and tuber crops more widespread among resource poor farmers. By way of doing this RTIP also, necessarily, deepened and widened available information on these crops among the scientific community, government staff and the public at large. In the same vein, RTIP had a positive, albeit limited, impact on the public sector institutions associated with its implementation and the services they provided.

⁵ See Appendix V (page 59) for further information on economic and food security aspects of the RTIP.

21. As noted above, RTIP has not had the impact on household income levels on the scale that it aspired to. Nor has RTIP made a significant impact on social capital and empowerment of resource poor households that it might have had were more attention to have been given to these matters. The evaluation team found no evidence that RTIP has had any impact on policies or regulatory frameworks that affect the rural poor. Whereas, it will very likely have had a negative impact on the environment in so far as increased and intensified cassava production worsens soil nutrition status.

22. An estimated 39% of recorded RTIP beneficiaries were women, however RTIP efforts to ensure equitable impact, by gender, were limited. This was a weakness in both the design and the implementation of the project. Notwithstanding the fact that women were to be considered priority members of the RTIP target group, according to the Appraisal Report, the project did not explicitly monitor its impact on women, nor did it systematically disaggregate data by gender in its records or analyzes. RTIP did not adequately compensate for the missing collaboration with the IFAD-financed VIP project that was to involve women through its activities in processing of root and tuber crops. The project overlooked the opportunity it had to take into consideration gender specific needs and priorities in the implementation of RTIP research and extension components. Likewise, it neglected to actively promote the participation of women in the secondary and tertiary multiplication of improved planting materials.

23. The evaluation team has rated as “highly likely” the sustainability of RTIP impact in those areas where change was farthest reaching, i.e. food security (including farming technology, agricultural production and lower frequency of food shortages) and access to information. Whereas, it is considered unlikely that RTIP’s modest impact on social capital and on services provided by public sector institutions will be sustained without further support.

24. The design of RTIP, nation-wide in scope with a focus on one commodity, was itself an innovation at a time when the lion’s share of IFAD financing was going to area-based rural development projects, irrigation and rural finance. Further, the RTIP design responds to the identification of roots and tubers as “poor man’s” commodities. The assumption that by supporting the development of these crops RTIP would benefit the poor people who grew them was innovative as an approach to poverty reduction. Yet it proved to be only partly true. The innovative choice to focus on a commodity was useful as far as it went, but it had limited impact on the levels of poverty of its producers in so far as it focussed primarily on production and almost exclusively on production of cassava. Insufficient attention was given to the characteristics of new varieties in the light of the role of the selected crop in the economy of a resource poor household.

25. As a nation-wide project RTIP cannot be up-scaled, however it does offer some useful lessons with respect to replicability. In particular, RTIP’s three-tier planting materials multiplication and distribution system proved to be a successful one that merits consideration for replication in other crop improvement programmes. Furthermore, RTIP’s development of an informal network whereby it exploited the knowledge and resources of a host of institutions and resource persons throughout the country and beyond provides a model that could and should be replicated by other projects and institutions. RTIP collaboration with IITA and the exchange of experiences with IFAD projects on roots and tuber crops in the region are also excellent features that merit replication.

26. The performance of the central partners in the basic tasks of project design and implementation, including loan administration, technical backstopping, and implementation support has been without any major problems. The main weakness in IFAD performance was in the design of the project with its insufficient or incomplete approach to targeting and its choice of an unsuccessful strategy for covering processing and marketing questions. To its credit, it has added intellectual and financial resources to complement the supervision process by the cooperating institution. The physical presence in country of the World Bank as the cooperating institution has been a strength in terms of accessibility by the project and resultant efficiency of loan administration. However, this has also had drawbacks where the Bank has become over-involved in budget details of individual project activities and expenditures. Its took an interesting and innovative “team” approach to the implementation support dimension of

supervision that brought benefits to RTIP by exposing it to a wide range of knowledgeable experts. A drawback of this approach that would require correction was that responsibilities and accountability were sometimes too diffuse.

27. The International Institute for Tropical Agriculture (IITA) proved to be a very valuable partner in providing technical backstopping to RTIP through an IFAD technical assistance grant. Their involvement was a successful feature of project design and of project implementation. The fact that IITA has also supported other IFAD efforts in root and tuber crops in the region was an added benefit that has facilitated even further sharing of knowledge and exchange of experiences. The performance of RTIP's limited number of NGO's and CBO's partners was good and RTIP benefited from their outreach capacity and knowledge of local conditions.

28. The overall assessment of the evaluation team is that, given its ambitious size and its complexity, RTIP has been well-managed and successfully implemented with good results in most areas. Its greatest strength was in creating a well-functioning nationwide system for multiplication and distribution of improved planting materials. In the process it strengthened numerous institutions, increased farmer access to information, improved production practices and contributed to better household food security. By contrast it fell short of its full potential in terms of poverty reduction impact, due in part to deficiencies in the RTIP's design and in part to RTIP's incomplete or inadequate implementation of its planned activities.

29. The most serious design deficiency was what proved to be unrealistic and unsuccessful provisions for covering post-production and marketing issues. This design deficiency was compounded by inadequate attention to these same issues in implementation. Of comparable gravity was the deficiency in RTIP's design with respect to targeting. RTIP lacked provisions that could and should have been made to take a "pro-poor" approach in each of its components. It also lacked measures to ensure a better gender balance in the accrual of benefits. As a result, during RTIP implementation, management and technicians put technical considerations before target group considerations, meaning that impact on farmer incomes was not taken adequately to heart. During implementation RTIP also over-emphasized cassava with relative neglect of yam and cocoyam that meant neglect of the zones and households that favour those crops.

30. The recommendations for the remainder of the RTIP implementation period and the preparation of future investments are:

- Limitation of further distribution of improved cassava planting materials to areas with proven high demand for cassava for processing, i.e. PSI areas,
- Completion of IPM infrastructure and conducting a study to assess financial and economic impact of RTIP IPM approaches
- Continuation of varietal release programme, with production of extension materials and the development of a web-site to store and share information generated by RTIP
- Expansion of Adaptive Research component to include other research needed to achieve RTIP objectives
- Concentration of support to groups on processing groups and producer groups working with the Ayensu Starch Company
- Recruitment of 1-2 officers for post-production and marketing component to review existing situation and help identify needs in an eventual Phase II investment
- Review of the current M&E system to pare down collection and processing of data on RTIP physical and financial progress

31. The Office of Evaluation supports a second phase investment to follow up and consolidate investments and activities that have been undertaken through RTIP to-date. In this context its recommendations are the following:

- Future investments by the Government of Ghana in support of the development of particular crops, as in RTIP, should be designed to support the entire vertically integrated commodity chain.
- Future IFAD investments in the development of root and tuber crops in Ghana should maintain improved food security and increased household incomes for the rural poor as their overall goals.
- Past assumptions about crop sector development and its impact on poor rural households should be carefully re-examined in the design and in the implementation of future investments.
- Large scale campaigns for the multiplication and dissemination of improved varieties should be used to reduce rural poverty only once socio-economic benefits to poor farmers who adopt improved materials have been fully assessed and only in cases where it is clear that the market can absorb a large supply response, as with the government PSI initiative.
- Agricultural research and farmer field schools, or other extension activities, should be demanded. Farmer priorities must be routinely ascertained and given ample weight alongside technical and agricultural policy considerations.
- A study should be undertaken of the comparative costs and benefits of farmer field schools versus those of normal extension practices at the district level before further investments are made in this approach.
- Future investments for reducing poverty through investment in root and tuber crops should emphasise activities related to post-harvest, marketing and development of new market opportunities.
- Among post-harvest and marketing activities that should be considered for support are: (i) appraisal of technical and financial viability of existing processing equipment; (ii) training and advisory services on processing techniques; (iii) training on hygiene, health and environmental issues at processing sites; (iv) advisory services on packaging and labelling; (v) improved storage methods, (vi) regular dissemination by radio of price information; (ix) promotion of linkages between producers, processors, and traders on outputs and equipment and, (vii) elaboration of various financing models and arrangements with financial institutions to fund processing equipment and working capital requirements.

Republic of Ghana
Root and Tuber Improvement Programme
Interim Evaluation
Main Report

I. INTRODUCTION

A. Background to the Evaluation

1. The Root and Tuber Improvement Programme (RTIP), financed by IFAD and the Government of Ghana, became effective in January 1999 and is due to close in December 2004. The Government of Ghana, in collaboration with the IFAD Africa I Division, indicated an interest in continuing to work together in this sector beyond December 2004. They have envisaged the possibility of a second-phase project to be financed by IFAD. According to IFAD procedures, if there is to be a second phase of any project, the first phase must be evaluated before design of the second phase begins. In this light, the overall objective of the evaluation was to learn, together with partners, to improve the future performance of this and other related programmes.

2. The evaluation was done according to the current IFAD Methodological Framework for Evaluation⁶. As such, in response to the interests of IFAD and IFAD's governing bodies, the evaluation team set out to evaluate the impact of the project on rural poverty in six specific domains. These impact domains are: (i) financial and physical assets; (ii) human assets; (iii) social capital; (iv) food security; (v) environment; and, (vi) institutions and policies. In addition, the evaluation team was to look into a number of key questions identified by other partners to the evaluation.⁷ These included:

- What strategies has the programme used to target poorer members of communities? And how effective have they been in reaching those people?
- To what extent have increases in yields from newly adopted varieties resulted in increased incomes or increased food security for poor households?
- How successful has the programme been in choosing research topics, choosing researchers, ensuring farmer participation in research and linking research to extension?
- What agro-ecological zones have benefited most from the programme?

B. Approach and Methodology

3. The first step was an initial stocktaking exercise by the Office of Evaluation through the review of existing documentation. This was followed by a preparatory mission to Ghana 7-14 May 2003 to establish the Core Learning Partnership for the evaluation process, to identify key areas to be assessed during the main evaluation mission, and to prepare the logistical, time and methodological framework for the main mission.⁸ An Approach Paper was drafted as a result of this mission.⁹ It outlined the overall approach to be taken in the evaluation and specified the Core Learning Partners (Footnote 1).

⁶ IFAD Office of Evaluation, Rome, May 2003.

⁷ These topics provided a general underpinning to the inquiry and analysis done under the IFAD evaluation framework and thus related information appears throughout the evaluation report. In addition, summary answers to the questions are presented in Appendix 2.

⁸ The preparatory mission comprised Ms. Chase Palmeri, IFAD Office of Evaluation and Mr. Michael Marx, FAO Investment Centre, TCIW.

⁹ See Appendix 1.

During this mission, a review of the monitoring and evaluation activities of the RTIP also took place.¹⁰ The results of this review have been incorporated into the main evaluation report.

4. Subsequent to the recruitment of the additional members of the evaluation team, a further review was undertaken of all available reports and other documents relevant to the RTIP programme. In addition, the PCO, the IFAD Country Portfolio Manager, and the World Bank Task Team Leader were asked to undertake self-evaluations of their own performance and the performance of their institutions¹¹.

5. The evaluation fieldwork had been scheduled to build on a “Beneficiary Assessment Study” (BAS) that was commissioned by the PCO to assess the socio-economic impact of the program on farmers. It was expected that the IFAD-led evaluation would have been informed by the primary data and observations of the BAS team. However, some delays in the BAS implementation prevented the evaluation team from accessing the BAS information before it undertook its own fieldwork.

6. The Evaluation Team¹² worked in Ghana from July 26 – August 15, 2003. During the first days in Accra, the evaluation team familiarised itself with the current status of the project, met with the Task Team Leader of the World Bank, and visited the Ayensu Starch Company to discuss the prospects of starch processing in Ghana. On July 28 it met with some of the Core Learning Partners and with the institution that undertook the BAS. The team then proceeded to Kumasi, where it held discussions with project staff and some co-operating institutions. This was followed by a ten-day field trip to a number of districts to assess project performance and impact on beneficiaries. During this trip, discussions were held with representatives of MOFA at regional and district levels, co-operating institutions, research institutions, NGOs, farmer and women groups and individual farmers¹³. The team presented a summary of its observations and recommendations to Core Learning Partners, first in Kumasi on August 12, and then in Accra on 15 August 2003. The Hon. Deputy Minister of Food and Agriculture, Mr. Clement N. L. Eledi, and Ms. Chase Palmeri, IFAD, the Senior Evaluation Officer in charge of the RTIP evaluation, also participated in this session.

7. The team wishes to express its appreciation and thanks to the Core Learning Partners, government officials, farmers, food processors and other discussion partners for dedicating their valuable time to the mission, for their frank responses and their hospitality. Especially warm thanks go to the PCO of the RTIP that provided excellent logistical support and lively intellectual exchanges throughout the field mission.

¹⁰ Review undertaken by Ms. Mary Netto, Evaluation Assistant, Office of Evaluation, IFAD, from 07.-17.05.2003.

¹¹ Interviews with current and previous Country Portfolio Managers in charge of the RTIP had been undertaken in Rome, the others in Ghana.

¹² Team members were Dr. Michael Marx, FAO, Rural Finance and Rural Development Specialist, serving as Team Leader, Mr. Thomas Muenzel, FAO, Agricultural Economist, Professor Andrew Westby, NRI, Post-Production and Marketing Specialist, Dr. Eric Danquah, University of Ghana, Legon, Plant Breeding and Genetics Specialist, Ms. Sarah Mader, IFAD, Office of Evaluation, Agricultural Economist and Gender Specialist, Ms. Mary Netto, IFAD, Office of Evaluation, Evaluation Assistant.

¹³ The mission visited Ga, Tamale, West Gonja, Bole, Bolgatanga, Bawku East, Kassena-Namakana, Sekyere West, Ejisu-Juben, Ho and Kpando districts during the field trip. Criteria for selecting districts for inclusion in the evaluation field work included relative importance of root or tuber crop promoted by RTIP, date of RTIP start-up of operations in the district, and presence of NGOs, FFS or research institutions in the area. Districts recently visited by other official missions were avoided.

II. MAIN DESIGN FEATURES

A. Project Rationale and Strategy

8. RTIP was the first of four IFAD-funded projects in Africa concentrating on the root and tuber sector¹⁴. The RTIP Project Appraisal Report (PAR) cited four compelling reasons to develop this commodity sector:

- i. root and tuber crops, because they can be grown all year round and grow well on poor soils, can mitigate the vulnerability of resource-poor communities to seasonal food scarcity;
- ii. as root and tuber crops are grown largely by the poorest segment of the rural population, improvements in root and tuber crop productivity will positively affect the incomes of those producers;
- iii. the development of the root and tuber sector is important to further diversify the agricultural sector; and,
- iv. investments in the root and tuber sector would provide new opportunities to smallholders to increase incomes, thus favouring more equitable income distribution in the rural economy.¹⁵ At the time roots and tubers contributed 40% to agricultural GDP. Grown by about 55% of all farming households in Ghana, these crops were seen as both important revenue earners for poor households and potential contributors to export earnings.^{16/17}

9. A number of other conditions and assumptions also drove the development of RTIP. There were three new cassava varieties ready for multiplication and distribution, which had much higher yields than existing varieties and that were much more disease-tolerant. It was assumed that if these varieties could be multiplied and distributed they would give farmers higher yields. It further assumed that more varieties could be released if only funds would be made available and the institutional arrangements made for an optimal collaboration among the different relevant players. For yam, cocoyam and sweet potato, it was assumed that combined efforts would lead to the release of new varieties that might have similar advantages over existing ones as with cassava. And, it was assumed that – in addition to improved varieties – improved farming techniques and planting material multiplication at local levels, could bring increases in yield and output levels. Ultimately, increases in yields and outputs were expected to lead to increases in incomes. For the most part, all but the last assumption held true during RTIP implementation.

10. Given that official MOFA production and consumption estimates at the time of project preparation suggested a considerable national annual surplus production of cassava of about two million tons, the fact that assumption that increased yields would lead to increased incomes did not hold true is hardly surprising. Moreover, it calls into question the thoroughness with which RTIP designers thought out the project concept.

B. Project Area and Target Group

11. The programme was designed to be national in scope, covering potentially all the ten administrative regions and 110 districts in Ghana. It was intended to target interventions in accordance with the specific development potential of each of the major agro-ecological zones¹⁸.

12. The target group was defined as 720 000 resource-poor farmers who gained their livelihood mainly through subsistence-oriented farming. Priority was to be given to women. The PAR proposed a non-confrontational approach to identify areas of concentration of resource-poor farmers where access

¹⁴ Others were located in Benin, Nigeria and Cameroon.

¹⁵ IFAD: Ghana Root and Tuber Improvement Programme, Appraisal Report. Main Report and Annexes. Report No. 0829-GH. November 1997, p. 17-18.

¹⁶ GLSS 4, 1999.

¹⁷ PAR p. 5-6.

¹⁸ PAR p. 19-20

to basic food requirements was highly insecure. As a means of targeting it opted to provide farmers with initial planting material for only 0.1 acres (=400 sq.m.). Local informants and traditional chiefs were to help to identify those households who should have priority access to planting materials.

C. Goals, Objectives and Components

13. The overall objective of the programme was to enhance food security and improve the incomes of resource-poor farmers by facilitating access to new but proven locally adapted technologies for root and tuber crops (cassava, cocoyam, yam, and sweet potatoes).

14. To achieve this overall objective, there were six specific objectives:

- (a) Develop a sustainable system for the multiplication and distribution of improved planting materials for root and tuber crops in order to increase their availability to smallholders;
- (b) Develop an integrated pest management system including biological control, to reduce the incidence of diseases and pests and increase the productivity of smallholder root and tuber crop systems;
- (c) Strengthen adaptive research for the root and tuber crops in order to increase the flow of new technologies available to farmers, including women;
- (d) Collect, evaluate and conserve root and tuber germplasm in order to help conserving the rich plant biodiversity of Ghana;
- (e) Empower resource-poor farmers, farmer groups and rural communities including women, to ensure unimpeded access to improved root and tuber technology; and
- (f) Strengthen sector institutions to ensure effective programme management and sustainability.

15. Five programme components were included to achieve these objectives:

- (a) Planting Material Multiplication and Distribution (USD 3.3 million)
- (b) On-farm Adaptive Research (USD 2.6 million)
- (c) Integrated Pest Management (USD 0.9 million),
- (d) Community Support and Mobilisation (USD 0.6 million)
- (e) Programme Management and Co-ordination, sometimes referred to as Institutional Support and Linkages (USD 1.5 million).

16. Total budget provisions including contingencies were USD 10.11 million, of which 45% were foreign exchange and 55% local currency amounts.

17. The PAR emphasised the importance of post-harvest processing and improved marketing conditions, however financing for such activities, included at the formulation stage, was absent from the project at appraisal. This was based on the assumption that support for these activities would be provided under other IFAD projects.

D. Implementation Partners and Arrangements

18. The main implementation partner was to be the Ministry of Food and Agriculture (MOFA). RTIP was designed to be mainstreamed into the core activities of MOFA. The Crop Services Division under the Technical Services Directorate would be in charge of programme implementation. A national co-ordinator from within the division would head the management team. A National Programme Steering Committee, comprising MOFA, the ministries of Local Government and Rural Development and Environment, Science and Technology, some of the most relevant participating institutions and VIP would oversee implementation and provide guidance in specified cases.¹⁹ Implementation at regional and district levels would be co-ordinated by the respective Regional and District Directors of Agriculture. Districts would implement the RTIP through the sub-committee on agriculture and draw on the existing expertise to work with farmers and elaborate budgets and work

¹⁹ Comprising CSD, DAES, PPRSD, WIAD, AESD, PPMED, GLDB, CSIR, CRI, SARI and FRI.

plans. The District Director would be assisted by front-line staff in day-to-day work. The aggregated work plans and budgets were conceived to be the Annual Work Plans and Budgets (AWPB) financed by the loan proceeds.



This women's group is responsible for processing cassava into gari. Gari is made from the root of fresh cassava which is peeled, grated into a mash, left to ferment for up to 24 hours, and then heated. Eaten as a snack, children take it to school soaked in water and sugar. The women also sell gari in local markets but the increased production of cassava has led to a drop in prices. *IFAD photo by Sarah Mader*

19. A number of partners were assigned various roles in implementation:

- Under the PMMD-component, the Ghana Seed Inspection Division of PPRSD and the Grain Legumes Development Board had the responsibility for certifying planting materials;
- Under the IPM-component, the IITA, PPRSD, CRI and SARI were to make inputs to the biological control programme;
- Under the Adaptive Research component, primary partners included the CRI, SARI, FRI, CRIG, PGRC, SRI and the universities, under the overall co-ordination of the Council for Scientific and Industrial Research (CSIR);
- Under the CSM-component, the RTIP was to collaborate with the VIP (funded by IFAD and WB) in terms of awareness creation about root and tuber crops and the funding of post-harvest equipment.

20. A strong collaboration with the other existing projects and programmes in all possible dimensions was envisaged in the PAR, in particular with the VIP and the REP. To ensure real rather than token linkage, formal mechanisms for establishing co-ordination were recommended by the PAR. Given the nature of the post-production activities, and the fact that RTIP was being managed through the Crop Services Division of MOFA, the decision to leave these investments and activities to other agencies and projects whose mandates made them better suited to support such areas was a logical one. Regrettably, foreseen arrangements did not materialise as planned.

21. Supervision was vested with the IDA/WB resident mission. It was to include: (i) continuous supervision and implementation assistance; (ii) regular supervision and monitoring of key events through supervision mission; and, (iii) yearly review of the work programme, the project-launching workshop and the mid-term review. Apart from the Task Team Leader (TTL), the regular supervision team was to include appropriate expertise as needed²⁰. Supervision missions were to look at physical implementation, management performance, impact and financial control.

²⁰ Including agronomists, sociologists, financial analysts, economists, institutional specialists and procurement and disbursement specialists.

E. Major Changes in Policy and Institutions during Implementation

22. The advent of the President's Special Initiative (PSI) on Agribusiness/Cassava during the RTIP implementation period constituted a policy change that substantially affected the project. The PSI created a new environment to which the RTIP successfully adjusted. The PSI led to the establishment of a factory for export-oriented starch production near Accra²¹. A memorandum of understanding signed in 2002 between the RTIP and the PSI provided the basis for the delivery of improved planting material to the factory for distribution to farmers. By 2003, RTIP had supplied 94% of the agreed quantity required to plant 2,000 ha. The massive campaign carried out by the proponents of the PSI and the media coverage that accompanied it heightened the awareness of farmers nation-wide of cassava as a raw material for starch, the production of starch and its different domestic uses. This, in turn, led to a much higher demand for information on improved cassava production and processing techniques and for the improved planting material itself. However, the PSI campaign confused some farmers as its approach differed from that of RTIP but was promoted by the same AEA's.

23. Had the demand for improved cassava planting material been high before, it almost exploded with the PSI campaign. In media campaigns RTIP was mentioned frequently in connection with the PSI and portrayed both as derived from government policies. As a consequence, the PSI and RTIP reinforced one another. Without the timely delivery of planting material by RTIP, it would have been impossible for the PSI factory to start production at this early stage. Without the national media campaign linked to the PSI, RTIP would not have achieved the same level of awareness and interest in improved production of cassava. Many farmers, previously uninterested in cassava production became interested in as a result of the PSI, assuming that there would be a ready market for their produce.

F. Design Changes during Implementation

24. There has been only one major design change since approval of the loan and signature of the loan agreement. This concerns the area of post-production and marketing. As noted above, despite recognition of their importance, the PAR did not envisage financing any specific activities or investments in this area, other than the promotion of cost-effective gari-roasting stoves. However, participants at the project start-up workshop recommended adding a PPM-component²². They proposed a component to address post-harvest losses, to introduce farmers to post-production technology, and to assist them with improved storage systems and marketing. The budget proposed for this new component was USD 277 000 for 1999 and USD 187 000 for 2000 to be financed with loan funds from the Adaptive Research and Community Support components. However, all activities proposed have been implemented with much less vigour than other components, and no specific responsibility was allocated to any RTIP staff to guide, implement and monitor activities.

²¹ The Ayensu Starch Co. Ltd. started production in July 2003, with a capacity to process 100,000 tons of fresh cassava annually that requires delivery by about 5,000 farmers cultivating on average one hectare of cassava for starch purposes only. Government announced plans to set up as many as 10 factories in total throughout Ghana.

²² IFAD and MOFA: RTIP Workshop to plan the implementation of the programme for the period 1998-2000. August 1998 (prepared by Nkum Associates).

III. SUMMARY IMPLEMENTATION RESULTS

Planting Material Multiplication and Distribution

25. This component sought to develop a cost effective and sustainable system for the multiplication and distribution of planting material of improved varieties of root and tuber crops (including cassava, yam, cocoyam, sweet potato and fra-fra potato) in order to accelerate the multiplication process, to ensure that resource-poor farmers have access to improved planting materials in a timely manner, and to establish a planting material inspection service to ensure that planting material supplied to farmers meet acceptable standards. A three-stage strategy was adopted for the multiplication of cassava and sweet potato under the RTIP as follows. First, materials from breeders are multiplied under optimal agronomic conditions to produce clean and healthy foundation planting materials. Second, foundation planting material is transferred to certified farmers for further multiplication under less strict agronomic conditions. Third, the resulting certified materials are then distributed to farmers for direct use and further distribution to other interested farmers.

26. The country was divided into six zones according to agro-ecological zones and type of root and tuber crops, which were predominant and have economic advantage in each zone. At the primary sites, the Grains and Legumes Development Board (GLDB) and five MOFA stations multiplied planting material. Regular inspection of multiplication sites by Planting Material Inspection Teams (PMITs) comprising entomologists, plant pathologists, agronomists/seed technologists and plant breeders appointed by the Programme Co-ordinating Office in collaboration with PPRSD was done. Off-type and diseased plants were eliminated. At secondary sites, cuttings from the primary sites were taken to secondary sites of multiplication, which were more locally situated out-growers or community farms to further multiply planting materials. Secondary site farmers, who were among the best farmers in a district, are given planting material for a maximum of five acres. Based on an agreement concluded with MOFA, they were given financial assistance for initial land preparation and weeding. At the end of the first year, planting material was coppiced and distributed to tertiary farmer groups. The ratoon field was again coppiced at the end of the second year. Two-thirds of the planting material was to be distributed to tertiary farmer groups. Secondary site farmers could keep the remaining third or sell it to RTIP.

27. The tertiary farmer groups that received certified materials from secondary farmers were to be composed of individuals with the following characteristics:

- resource-poor
- part of a group of 5-15 farmers
- planting 0.4 to 1.2 ha of cassava
- without permanent ownership of lands, i.e. those traditionally renting land, or practising share-cropping,
- with difficulties in accessing credit from formal sources, and
- with tertiary multiplication fields located within 20 km radius of secondary sites.

28. Approximately 50-60% of tertiary farmers receiving certified materials were to be women.

29. The design of the multiplication and distribution of sweet potato was similar to that of cassava and involved multiplication at the three multiplication sites, primary, secondary and tertiary. Vines from the primary multiplication sites were subsequently multiplied by secondary multipliers. Tertiary sites are at the third stage of multiplication from where vines get to farmers through the normal farmer-farmer diffusion channels. As regards cocoyam, a strategy for multiplication is yet to be developed. Three primary multiplication sites for cocoyam have been involved so far, and the material generated at the primary sites has been distributed directly to farmers. The same applies to yam, where

four primary sites have been established. The material to be generated will be distributed directly to selected farmers for multiplication and distribution to ordinary farmers.

30. Production of root crops is dependent on a supply of vegetative planting materials. The multiplication rate of these materials is very low in comparison with grain crops, which are propagated by true seed. For cassava, planting materials are bulky and highly perishable as they dry up within a few days after harvest, and hence their multiplication and distribution are expensive relative to conventional grain-based seed services. The yield stability and development of cassava is highly dependent on the quality of planting materials, and there is evidence that the initial use of healthy cuttings is a very important factor in the subsequent attainment of good yields. Cuttings with low vigour or which is infested/infected by pests and diseases, often limit cassava production. Biomass production is low in dry agro-ecosystems and production of planting material in sufficient quantities is a major restriction to the widespread and rapid adoption of the crop or a variety. The design of the planting material multiplication and distribution component was, therefore, a crucial aspect of the performance of the RTIP. At the onset of the RTIP, four improved varieties of cassava and four improved varieties of sweet potato had been developed under the National Agricultural Research Programme (NARP). Quantities of the improved varieties available were inadequate for distribution to farmers. A rapid multiplication strategy, therefore, was necessary. Considering the problems of poor quality planting material traditionally used by farmers, the design of the three-step multiplication and distribution of cassava and sweet potato was the best approach that could have been put in place to ensure usage of quality planting material by farmers. The design was innovative and very relevant to the overall strategy of the RTIP.



Cassava is the main staple food in West Africa. In Ghana, fresh cassava is processed into gari or eaten boiled or made into chips. Alternative uses for cassava (such as starch, glue or animal feed) need further exploration including identifying appropriate marketing channels. IFAD photo by Andrew Westby

31. With regard to delivery channels, it was evident from the appraisal report that the overall strategy had a limitation. The RTIP envisaged that planting material would be distributed within communities according to traditional exchange systems in portions sufficient to initially plant 0.1 acres. This limitation was an important self-targeting criterion since such small amounts will not be attractive to larger farmers. Strategies recommended in the project appraisal included information flow to the larger community of the programme's intended target of resource-poor farmers including women. Additionally, local chiefs supported by public services were to be entrusted with the responsibility for ensuring that the resource-poor families benefit directly from the programme.

32. Not all of the cassava farmers participating in the programme met the criteria for inclusion in the target group set in the start up workshop in 1998. Farmers owning more than 1.2 ha were included

as members of secondary and tertiary groups. However, this modification was appropriate in the case of secondary multipliers and tertiary farmers who were expected to multiply and pass materials on to others. Many resource-poor farmers would not have been interested or able to participate in groups because of constraints in land, labor, cash or time. Furthermore, resource-poor farmers, being on average more vulnerable to any fluctuation in output or income are obliged to be more conservative and risk averse, thus unwilling to adopt new varieties unless certain of deriving immediate benefits.

33. RTIP established an efficient system for the rapid multiplication and distribution of cassava planting materials in 50 selected districts between 1999 and 2002. This involved the four improved varieties, namely Afisiafi, Abasafitaa Gblemoduade and Tekbankye. The multiplication of Gblemoduade was de-emphasised at the secondary stage because majority of the farmers rejected it for its high water and low dry matter content. By December 2001, a total of 305.8 ha, 1,178 ha and 2,813.5 ha of land had been established at the primary, secondary and tertiary multiplication sites respectively. These represented 100, 90 and 78 percent of the targets for the three sites respectively. Altogether, 1,062 farmers were involved at the secondary stage. At the tertiary stage, 3,679 groups representing 86% out of a total of 4,273 groups formed as at December 2001 had been supplied with planting material. A total of 29,686 resource-poor farmers were involved.

34. As per the memorandum of understanding agreed upon between the PSI on Agro-Business and RTIP, RTIP has supplied 94% of planting material required for planting the agreed target of 2,000 ha in 2003. A total of 187,936 bundles were supplied to the PSI for distribution to 2,187 farmers in the Ayensu Starch Company operational areas, eleven District Assemblies and Ejura Farms Limited for multiplication at the tertiary stage. At the inception of the PSI, which was during the peak of the planting season of August 2001, the RTIP was directed to deliver planting material to tertiary farmers in four districts²³. RTIP therefore had to put on hold further distribution of planting materials to its tertiary groups in all the six zones to satisfy heavy demands of the PSI for planting materials. This slowed down the rate of establishment at tertiary multiplication sites. There were some cases of farmers who had prepared their plots and were ready for planting but were disappointed. Invariably, these farmers incurred extra cost in re-weeding before planting when the planting materials were eventually supplied. With regard to the type of farmers serviced under the PSI, information to date suggests that beneficiaries at PSI operative sites were not necessarily the resource poor that RTIP was designed to target. This deviation certainly was unavoidable in view of the fact that being an export driven initiative, majority of larger farmers were encouraged get involved because of the readiness of market of the produce. The potential impact of planting material supply to the PSI on the pace of the multiplication and distribution of planting materials could be accommodated through the intensification of the process as planned under the agreement between the PSI and the RTIP.

35. Two improved sweet potato varieties, Faara and Sauti, had been established on 4.8 ha out of a target 6.0 ha at primary multiplication sites at the beginning of year 2002 planting season. Secondary multiplication sites of sweet potatoes were established on 35.06 ha exceeding the target of 20 ha. By December 2002, a total of 1,209,500 vine cuttings had been distributed to 287 secondary farmers in the producing areas of Zones 1, 2 and 5. The distribution of sweet potato planting material to date went to 14,495 resource-poor farmers as compared to the target of 15,100 farmers. This figure includes supplies to 7,395 farmers in 2002 against the planned target of 8,000 farmers for that year. In the same year, seven local varieties were sanitised out of which 5,966 plantlets were produced and were multiplied for distribution to farmers. Monitoring of sweet potato multiplication fields in Zone 5 in December 2002 by the PCO indicated that plant growth had been retarded by either floods or drought. This slowed down the distribution of planting material to tertiary farmers in the zone. Farmers were advised to establish nurseries in low-lying areas to avoid the loss of planting material during the main dry season from January-March 2003. During the planting season, October-November 2002, 5,160 tertiary farmers in Zone 1 were supplied with coppiced vines from the secondary fields.

²³ Awutu-Efutu-Senya, Upper Denkyira in the Central Region, Fantekwa and Asuogyaman in the Eastern Region.

36. For yam and cocoyam, there was very little progress. Multiplication of Pona and Laribako varieties of white yam began at the primary level with the multiplication of 40,802 minisetts. Projected estimates indicate that over 100,000 minisetts would be available by 2004. With regard to cocoyam the PCO commenced multiplication in the minor season of 2002 using the micro-propagation technology. An area of 1.31 ha of cocoyam cultivars was planted at the MOFA stations.

37. As emphasised in the PAR, there was a weak and uncoordinated system for the multiplication of improved planting materials for root and tuber crops before the RTIP. With the exception of a few hectares managed by the Crop Services Department (CSD), the multiplication and distribution of root and tuber crops was not considered a priority responsibility of any agency. There was, therefore, no systematic surveillance and inspection of root and tuber multiplication sites to ensure that planting material that got to farmers were disease free and of the highest genetic quality. Planting materials developed by CSD were sold to farmers who could afford them, thus becoming inaccessible to most resource-poor farmers. Against this, the planting material multiplication and distribution component of the RTIP has made very good progress towards achieving its objectives downstream from primary multiplication sites to tertiary sites. Under the current system, assuming that tertiary multipliers provide some planting material through the normal diffusion process to about five farmers in the case of cassava and ten for sweet potatoes (as gathered from the field survey), RTIP is likely to reach its targeted 720 000 farmers by the end of the project, all other factors remaining equal.

On-farm Adaptive Research

38. The specific objective of the Adaptive Research Component (ARC) was to strengthen the adaptive research system for root and tuber crops in order to increase the flow of new technologies available to farmers, including women. The objective was to be achieved through the following six outputs:

- Germplasm collection and characterization
- Development of weed management practices for root and tuber based systems,
- Development of soil fertility enhancing techniques involving legumes, green manure and composting
- Collection and analysis of socio-economic data for best practices for use by extension
- Establishment of multi-location trials to select new root and tuber crop varieties for ecozones and product uses (varietal releases)
- Development of high yielding and more efficient cocoyam/rice systems in lowlands.

39. The PAR sets out the need for an “on-farm adaptive research” component to RTIP. It was envisaged that there would be work on germplasm conservation, cassava research, including varietal selection, storage techniques for germplasm, multi-locational trials and HCN gas control in cooking. There was to be yam research, mainly on the miniset technology, use of cover crops and soil fertility issues. Sweet potato research was to include multi-locational trials, storage and processing techniques and multiplication and distribution of planting materials. Cocoyam research was planned on germplasm characterisation, with on-farm trials of promising lines. Fra-fra potato research was to consist of agronomic studies and in-depth indigenous knowledge studies. And, there was to be work toward sustainable soil fertility management, including testing of composting systems and development of economic evaluation of tree planting schemes. The logical framework indicators presented were all specific to these issues.

40. From a design perspective, the adaptive research component was “all embracing” on certain issues – but others were obviously lacking including aspects of IPM and post-production research. The lack of a post-production research component reflected the general weakness of the production focus of RTIP and consequent problems with over production and hence “marketing” problems as expressed by farmers.

41. Progress has been made in all of the areas of work outlined by the component. Management of the ARC started weakly, but improved after 2000 when a National Co-ordinator was designated to assist PCO in the co-ordination of research activities under the Programme. He has been assisted by four zonal co-ordinators and the Deputy Director of PPRSD. This has worked very well in terms of co-ordinating research activities at the zonal level. However, the ARC would have benefited from closer integration with the other activities of RTIP to increase the responsiveness of the ARC to larger RTIP issues.

42. As regards the selection of research topics, the major funding round for the programme took place in March 2000. Proposals were submitted by researchers. The workshop considered the proposals submitted and selected or rationalised those thought to be most appropriate. The topics covered corresponded roughly to those identified in the Appraisal Report, whereas a process whereby RTIP pursued a participatory identification of topics to be researched giving greater consideration to the needs and priorities of poorer farmers might well have led to selection of different topics, privileging poverty reduction over commodity development goals.

43. In addition, selection of proposals could have been improved by allowing some external consideration of those received, adding extra insights and possibly improving the quality of research activities carried out. The approach adopted was somewhat piecemeal and lacking an overall “big picture” or strategic framework. Although some were brought late into the process, it generally created a programme that equitably shared work among the major research providers. All projects funded contributed in one way or another to root and tuber crop development in Ghana, even if all did not directly contribute to RTIP’s food security and income generation goals.



Peeling cassava roots in preparation for making Gari. It is also a good opportunity to socialise and exchange news and information.
IFAD photo by Andrew Westby

44. The PCO team has been very active in following up on the research plans and activities, assessing how they are progressing and advising on the way forward – a process that has also been reasonably well documented. This has been very positive and has contributed greatly to the success of the component. Similarly the constraints facing the ARC component have been detailed by the PCO in Annual Reports. This level of honesty in reporting is to be commended and it will certainly have helped staff and RTIP partners learn from their experiences.

45. The PCO relied largely on annual workshops to present research results. This has worked well in terms of researchers meeting and exchanging views. It has also helped in terms of reviewing the work programmes. The proceedings of the workshop are, however, time consuming to prepare²⁴. It

²⁴ The proceedings of the meeting last November are still not available.

would have been helpful if annual reports were prepared with a one page per project summary to allow for a quick clear view on the progress made²⁵. Further, a web-site might have facilitated the availability of research outputs between researchers in Ghana, potentially to extension and also for the West Africa region more widely where there are similar agro-ecologies and hence similar problems to be solved²⁶.

46. The overall quality of research, bearing in mind the resources available, appears good and some significant advances have been made. For example, on 31 October 2002, the National Varietal Release Committee released five new varieties of cassava, which had been developed with RTIP assistance. Three of them namely (Eskamaye, Nyerikobga and Filindiakong) are early-maturing and therefore farmers can harvest before the long dry season from December to May. The varieties are therefore specific and more suitable to the drier areas of Northern Ghana. The other two varieties 'IFAD' and 'Nkabom' are selections from local germplasm collected at the inception of the RTIP. They are highly tolerant to ACMVD and other diseases, give an average on-farm yields of 35tons/ha, and mature in 12 months. They both have good cooking quality and are acceptable for 'fufu' and other local preparations. The starch content is around 20-24% (on wet basis) and therefore is acceptable for the PSI. A variety of sweet potato (Teksantom) was also released in May 2003. This variety was also evaluated during the RTIP and is disease tolerant and high-yielding (over 20 t/ha) on farmer's fields. It has very high dry matter (41%), low sugar content, hence making it acceptable to most consumers, and has high vitamin C content.

47. There are more planned releases of cassava, sweet potato, yam and cocoyam varieties in coming years. In addition RTIP has issued recommendations for control of *Imperata cylindrica* with a combination of Mucuna and "Roundup", control of tuber rot disease through cultural practices and their dissemination to farmers; and, options for use of fertiliser and green manure to enhance yields and maintain soil fertility.

48. A major concern in a lot of the research is lack of socio-economic inputs that would have enabled a view on the financial viability of the technologies developed. The programme did try and address this recently through a training course in social science issues for scientists, but this was only a partial solution to the problem. Much of the research has been carried out on-farm and has involved the participation of farmers. This should have stimulated consideration of socio-economic issues, but the extent to which such collaboration influenced research design and evaluation of results is not apparent. Demand-led planning of research would facilitate linkages back and forth in the identification of problems and dissemination of research findings. In this connection there still needs to be greater emphasis on product evaluations, and not just yield evaluations.

49. The component was also weak in the dissemination of research results from ARC scientists to extension officers and farmers. Few of the ARC outputs are currently with extension services. Committees tasked with bridging the research-extension linkage have not been well supported since the National Agricultural Research Project, (NARP) closed. Furthermore, the fact that research is located in CSIR and extension in MOFA made the links between the two difficult especially given the absence of government promotion of exchanges between them.

50. ARC emphasised direct extension of research findings to the farmers involved in the on-farm trials. Although this had good results for those farmers, it reached a very narrow group and cannot be the only means of extension. A balance has to be struck between project specific research-extension linkages and support to the more generic systems such as the RELCs. This issue has to be given a high priority in the remainder of RTIP. The FFSs provide one outlet for research outputs, but RTIP must put into place an Extension Plan for research outputs as soon as possible.

²⁵ This could be prepared by the respective Project Leader and should be a condition of their contract.

²⁶ There will need to be careful consideration as to which information should be made available through a web-site. Research scientists should be given the opportunity to publish their findings in the international scientific press before the same information is made available on the web-site. Even then, copyright issues will have to be considered.

Integrated Pest Management

51. The objective of this component was to establish an effective capacity for biological control of common pests and diseases of roots and tubers by developing the necessary infrastructure and human resource capacity as well as the implementation of Integrated Pest Management (IPM) systems for cassava, yam, sweet potato and cocoyam. This objective is to be achieved through five outputs: (i) building infrastructure for IPM implementation; (ii) enhancing Human resources for implementing IPM of root and tuber crops; (iii) facilitating the implementation of IPM of root and tuber crops; (iv) implementation of IPM in cassava; and, (v) IPM Research. To achieve these objectives, three main areas have been emphasised: (i) biological control of major pests and diseases of cassava; (ii) formation and operation of farmer field schools; and, (iii) underpinning IPM research.

52. IPM involves the use of a number of pest and disease control techniques in tandem, including the use of disease resistant planting materials, good crop husbandry practices, biological control, and limited use of chemicals. It is important to ensure that any yield improvements from the cultivation of improved varieties are not lost because of pests and diseases. The major emphasis in the design of RTIP's IPM component was on the biological control of major pests and disease and the sanitisation of sweet potato planting materials. Major activities were directed to the building or refurbishment of insectaries and to the release of predators. There was a need to improve the insectary facilities in Ghana to allow a significant number of predators to be released, so project design was good in this respect. It may have been helpful to also look at other control strategies in the case of control of larger grain borer. Staff training and development were parts of the implementation of the IPM component as was the use of farmer field schools. However, there was a need to get the necessary information to all of the potential beneficiaries. Whereas FFSs were limited in number as was staff training. Further, as research into IPM is necessary to ensure that the next generation of IPM control strategies are available when farmers need them, the linkages between research and dissemination of research results should have been more specific.

53. From 1999 onwards AWPBs have defined detailed project plans focussing mainly focused on cassava including, amongst other activities, annual pest surveys, staff development, development of the FFSs and research activities for mainly cassava, cocoyam and yam IPM.

54. Under the sub-component "Facilitating the implementation of IPM of root and tuber crops", PCO conducted annual diagnostic surveys to identify new diseases and hotspots as a first step to disease control. This has been good and comes close to a demand-led approach that is needed to ensure that major pest and disease problems and the needs of the target group are being addressed.

55. Of the three insectaries RTIP was to support, only one in Pokuase is currently functional. Two others at Nyankpala (SARI) and Fumesua (CRI) are still not operational, thus delaying full implementation of the work programme. Scheduled to be in place by 2000, they are now planned for completion by the third quarter of 2003.

56. The initial logical framework in the Appraisal Report specified a "50% reduction in level of field infestations" as an indicator of the impact of the biological control work. This is too poorly specified to measure. Yet some impressive results can be noted. Release of the predatory mite *Typhlodromalus manihoti* (over two million) to Cassava Green Mite (CGM) has been achieved in seven of the 10 regions of Ghana, with the lowest impact in the dryer areas of Brong Ahafo with a 41% reduction and the best in forest areas of Central Region with an 80% reduction. Levels of damage rated on a scale of 1-5 have been reduced from 4 or 5 to 2.5 or less in all areas. Establishment in the dry zones remains problematic in the dry season and the project is wisely starting the use of *Neozygites tanoja* as included in the latest AWPB.

57. In the Northern Region, there has been a rather limited release of predatory beetle, *Teretrius nigrescens* (TN), to control Large Grain Borer, (LGB) in three locations. Release of TN in LGB "hotspots" of Volta Region (North) and Northern Region still deserves attention and action is necessary to speed up this process. There has been no measurement of impact, but the level of activity

would indicate that more progress is needed before there could be a 50% reduction in the level of cassava chips/konkonte storage pest infestation.

58. Grasshoppers have been controlled using *Metarhizium anisobela* (Green Muscle). This appears to have been successful because there have been no outbreaks for the last two years. This would exceed the Appraisal Report indicator. The sanitisation of local sweet potato varieties was a feature of the Appraisal Document that did not become part of the AWPBs.

59. Farmer Field Schools (FFS) were an important part of the IPM component. They were conceived as a forum for participatory bottom-up extension that aimed at introducing root and tuber IPM principles and practices to farmers. Seventeen FFSs were established in 15 districts. Two additional ones were not successful. From examples visited by the evaluation review team, these appear to have operated well, using established best practice and demonstration as a basis to give farmers practical agronomic and IPM skills and knowledge. Farmers interviewed showed a very practical understanding of, for example, planting practices and biological control, some of which they have been able to apply with their traditional varieties of cassava and well as the newly introduced varieties. It is important to note that despite the fact they are in the IPM component FFSs also cover the main agronomic issues concerned with root crop cultivation. From the limited number of FFSs seen, the main focus was on cassava linked to the varieties distributed by RTIP. The extent therefore of impact on the other root and tuber crops is questionable.

60. The FFSs could be strengthened with a stronger linkage to the adaptive research component of the project. There may well be examples of where research outcomes are being passed directly to the FFSs and where FFSs are benefiting from adaptive research carried out in the locality, but these were not obvious. Some formal procedure with oversight from the PCO would provide a means of ensuring a better linkage between research and extension. Finally, the current 17 farmer field schools are far from sufficient to reach RTIPs 720 000 farmers or even to cover the 76 districts where it currently operates. A review of the costs and benefits of this approach is called, and study of ways that it might be modified so that agricultural extension agents can extend their reach.

Community Support and Mobilisation (CSM)

61. This component sought to empower resource-poor farmers, farmer groups and rural communities, including women, to ensure unimpeded access to improved root and tuber technology. In conjunction with the VIP, it was to provide training in improved utilisation of root and tuber crop products, and to strengthen linkages to private firms involved in processing and exporting of end products such as cassava chips. In addition, the programme was to upgrade the skills of both government and NGO staff, and to ensure more effective collaboration with the beneficiary community, in particular with women. The training package under this component envisaged interacting with other programme components as well as with related projects such as VIP. It also aimed to lay the groundwork for making the programme as demand-led as possible by placing beneficiaries in a position to make an impact on programme decision-making, implementation and evaluation. An information, education and communication (IEC) campaign intended to raising greater awareness of root and tuber technologies at the community level was to be initiated. The PAR proposed to entrust the preparation of the IEC to private consultants.

62. Despite the component's crosscutting and strategic role, design did not specify a clear strategy for community development. Nor did it specify institutional modalities, operational strategies, or roles and responsibilities that would have helped achieve successful collaboration between RTIP and VIP and other potential partners. The PAR rightly suggested initiating an IEC campaign at the beginning of the programme, but without an explicit communication objective or strategy. Recruitment of a staff to guide the implementation of the CSM component was not foreseen. Hence the design provided a poor foundation for the establishment of strong complementary linkages with different projects and partners.

63. The project launching workshop in August 1998 recommended hiring a Group Formation Officer (GFO), but this only materialised in 2000. The late recruitment of the GFO delayed the

equipment of AEAs with basic skills on participatory methods and group formation, which in turn delayed the group formation and strengthening process. However, under RTIP many AEA's did eventually receive training for the first time in group-formation related PRA techniques.

64. PCO pursued the objective of this component through stakeholder awareness creation, building capacities of MOFA Regional Development Officers and AEAs²⁷, the organisation of resource-poor farmers into groups, and the collaboration with public sector firms and NGOs. Since February 2000, IEC activities have been undertaken through Awareness Creation Forums and Stakeholder Meetings, among others. Specific broadcasts on RTIP were made on different radio stations across the country, mainly by interviews and panel discussions. Print media and television were also used. A variety of IEC materials (e.g. brochures, technical fact sheets) have been produced in English. Publication of guidelines on cassava and sweet potato cultivation is scheduled for the end of 2003. AEAs visited communities and informed farmers on the programme objectives and the group concept for accessibility of improved planting material. Other farmers learnt from RTIP at agriculture fairs and exhibitions. However, with the advent of the PSI programme many farmers were unable to distinguish between the two programmes. This led to some difficulties as the latter created a widespread expectation that government or other agencies would purchase all cassava produced. Eventually, PSI publicity compounded RTIP awareness creation, causing demand for materials to outstrip supply in some districts.

65. Although the project launching workshop in 1998 recommended adding a post-production component to the programme, the IEC campaign only emphasised raising awareness on production aspects of roots and tubers. Too little importance was given to increasing demand for cassava products and informing farmers about markets prices for root and tuber products.



Producing Gari: the Root and Tuber Programme has provided farmers' groups with cassava grinding machines. Grinding the peeled cassava roots into a mash is the first mechanised step towards making gari.
IFAD photo by Sarah Mader

66. RTIP's original target to form some 100 farmer groups in each district each year was over-ambitious. RTIP intended to have 24 000 groups overall. By July 2003 RTIP claimed to have identified or formed a total of 9 474 production groups, 293 processing groups and 53 marketing groups and 51 end users, of which women constitute 38.7%. RTIP records the number of groups identified and formed and not the number of functioning groups. The actual number of functioning groups is estimated to be much lower. The group formation process is still ongoing.

²⁷ Through two trainings-of-trainers in 2001 and 2002.

67. The institutional capacity and performance of most groups is rather low. Only 3% of respondents of the BAS stated that they liked the group formation efforts of RTIP, with the exception of the few FFS that have been established. In some districts, the programme has hardly formed any groups. It is estimated that about 80% of the groups formed by RTIP were either non-functional or had disintegrated at the time of the assessment²⁸. The evaluation team observed stronger group cohesion and economic performance among processing/marketing groups than among most production groups. The predominantly male production groups were apparently only bound by their interest to obtain, multiply and distribute planting material. This, in fact, was the purpose for which they were created and the investment in their formation was correspondingly not high. As one would expect, the institutional capacity of these groups is weak and they are unlikely to continue to exist once they have served their original purpose. Nonetheless, the group approach did prove to be an effective mechanism to distribute planting material and disseminate information and knowledge on improved practices.

68. Processing groups, predominantly female and apparently indigenous groups, generally originated through either traditional mutual support and self-help mechanisms and/or the common interest in cassava processing. These institutionally more mature groups demonstrate a keen interest in becoming economically viable, although the capabilities for efficient management of rural enterprises are mostly weak.

Post-production and Marketing Component

69. The objective of the Post-Production and Marketing Component (PPMC) was “to improve access of resource-poor farmers, farmer groups and rural communities, including women to improved post-production technologies”. This component was not part of the original project design at appraisal, although a Post-Harvest Intervention Component amounting to about USD 950 000 or 12% of total project cost had been proposed during project formulation²⁹. With regard to processing and market infrastructure, it was envisaged that the VIP would provide the necessary assistance under its Post-Harvest Infrastructure Component. Consequently, as a condition of loan effectiveness, the operational linkages between RTIP and VIP were formalised in a Project Working Agreement in November 1998.

70. The agreement postulated that the two projects would complement each other on activities relating to post-production management and utilisation of root and tuber crops and that VIP would operate in the districts where RTIP would operate. The specific responsibilities of the Post-Harvest Infrastructure Project of VIP were to: (i) finance post-harvest treatment of crop and animal products; (ii) finance storage and other simple processing techniques; (iii) support the development of on-farm and village-level drying facilities to reduce post-harvest losses; (iv) provide on-farm and village-level market infrastructure for more efficient marketing of produce; and, (v) add value and enhance the shelf-life of cassava and yams. The latter was to be achieved by providing: (i) village-level drying and processing facilities; (ii) funds for the procurement of eligible processing equipment and facilities; (iii) on-farm and village storage facilities; and, (iv) technical assistance through organisation and the training of users.

71. During the project launching workshop in August 1998, it was acknowledged that improved storage, processing and marketing are key to raising farmers’ income from root and tuber production and therefore these aspects should be addressed by the project. Consequently, the PPMC was added as sixth project component and incorporated in a revised logical framework.

72. During the first two years, activities were to focus on collating and disseminating information on improved harvesting, storage and processing technologies, and market studies. Main areas of intervention which were subsequently added included: (i) training of staff, processors and potential

²⁸ BAS of RTIP, 2003.

²⁹ The initially proposed component aimed at promoting the development of small-scale enterprises in post-harvest aspects of root and tuber crops by strengthening the National Board for Small Scale Industries and its existing Business Advisory Centres in the Northern Region. In addition, it was envisaged to finance a wide range of processing equipment for small-scale operations and to provide technical assistance in the areas of food technology, nutrition, processing and utilization of root and tuber crops and products.

users in processing and utilisation of cassava flour, including dissemination of recipes; (ii) establishment of pilot cassava flour production plants; (iii) demonstration and dissemination of improved gari roasting stoves; and, (iv) adaptive research on utilisation of cassava flour and wastes, storage of yams and development of root and tuber snack foods.

73. Main implementing agencies were to be the Food Research Institute (FRI), Women in Agricultural Development (WIAD) of MOFA and the Biochemistry Department of the Kwame Nkrumah University of Science and Technology (KNUST) in Kumasi. Initially, it was not envisaged to have additional technical staff within the PCO for this component. However, following the mid-term review in 2002 a decision had been taken to recruit a Post-Production and Marketing Specialist who would co-ordinate and monitor the component's activities. The position is still vacant, as the post has only been recently approved by the Government. It is presently unclear whether the post can actually be filled before the end of the project.

74. Given that the achievement of RTIP's income raising goal ultimately depended on whether farmers would be able to profitably market any increased output, RTIP's design at appraisal was incomplete in so far as it stopped at production, making what proved to be unrealistic assumptions that the IFAD-funded VIP project would serve to address all post-harvest questions.

75. Despite the fact that the PPMC was part of the logical framework for the first two years, this component was never included in the overall logical framework of the project. In fact, all Implementation Support Missions to-date used the original logical framework taken from the Appraisal Report (which does not include the Post-Production and Marketing and Institutional Set-up and Linkages Components), with some minor adjustments to the indicators. Therefore, no results/outputs or corresponding indicators exist as a basis for planning and monitoring of the Post-Production and Marketing Component. Consequently, it is also not possible to assess the degree of achievement vis-à-vis the stated objective of the component. This shortcoming was not rectified during mid-term review, as it could have been. Planning of activities and budgets and setting of targets continues to be done on an annual basis.

76. Although a PPMC budget of more than USD 400 000 million had been prepared for the first two years of project implementation, there were actually no allocations made to this component during that period. All activities were funded under the Adaptive Research and Community Support and Mobilisation Components. As at end 2000, only about USD 40 000 had been spent on post-production related activities. Implementation was also hampered by the fact that there was (and still is) no subject-matter specialist available within the PCO to plan, co-ordinate and monitor post-production and marketing activities. As at end of June 2003, only about USD 112 000 have been spent on PPM-related activities, representing less than 2% of the total project expenditure to-date, and just over one fourth of what was budgeted for the first two years alone. One may add that while access to improved processing technologies is important, this alone does not automatically result in market access or improved income. It would therefore have been more appropriate to broaden the scope of the PPMC by not only focusing on resource-poor farmers, but also by targeting traders, commercial processors and other service providers in the sector in order to address marketing constraints in a holistic way.

77. In spite of the very limited financial and human resources for this component, a number of post-production related activities have been carried out to-date. Due to the initially unclear budget situation, activities on information dissemination concentrated during the first year on desk studies on storage, processing and utilisation of root and tuber crops. It was initially envisaged to investigate and promote improved labor-saving harvesting technologies. However, this never materialised. Collection of information on storage focused on sweet potatoes, which was complemented by rapid field surveys in Central, Eastern and Brong Ahafo Regions in order to document indigenous knowledge. Following the review, various treatment and storage technologies were tested by the Food Research Institute (FRI), indicating that even with improved clamp storage structures, rapid deterioration of sweet potatoes usually takes place two months after harvesting. A review of processing technologies identified improved designs for cassava graters and screw presses, which were adapted and fabricated by FRI and subsequently installed and tested in a number of gari processing plants. In addition, FRI developed

improved stoves for roasting gari that reduce health hazards. Sixty improved stoves were provided to 12 processing groups and were generally well received, although some stoves were abandoned, as they were considered not suitable by the beneficiaries.

78. The compilation of existing information on root and tuber crop post-production technologies at the beginning of the project was a logical first step before any post-production related interventions were implemented. At the same time, it can be seen as a major shortcoming that the information available and collected was never systematically analyzed, presented and electronically stored to make the information available to stakeholders and outsiders. The internet could have been an appropriate location for this purpose. In the absence of a database, it was not possible for the evaluation mission to obtain a comprehensive overview of the scattered existing information.

79. The processing technologies identified and developed by the project can be regarded as generally appropriate. Instead of focusing on individual pieces of technology, more emphasis should have been given to developing complete sets of equipment for various technically viable processing models representing different conditions and levels of production. For instance, the output capacities of the screw press and grater propagated by the project do not match, resulting in inefficient resource use and/or wastage during the process. The case of the gari stoves also shows the importance to involve the beneficiaries in the design of technology from the outset.

80. A major setback that affected the effectiveness of project interventions under the PPMC resulted from the fact that the expected co-operation between RTIP and VIP as outlined in the Project Working Agreement did not materialise. Initial problems with weak co-ordination at district level were aggravated by a change in VIP's policy, whereby it was required to channel funds through rural financial institutions instead of district assemblies as initially envisaged. This resulted in a delay of about two years, as all applications had to be re-submitted. At the time of evaluation, there was no evidence of the extent of benefits to RTIP groups from financial or technical assistance by VIP as initially foreseen. It can be assumed that the impact of the co-operation to-date is rather marginal. For instance, only two cassava-processing groups have been supported so far in Brong Ahafo/Ashanti Zone according to information from VIP. As a result, the effectiveness of many RTIP activities suffered from the missing crucial link to financial resources, improved market infrastructure and training. It is important to note that the extra PPMC component was designed and added to RTIP in 1998 assuming that the links to VIP would materialise. All parties appear to have under-estimated the importance of these links for the successful implementation, not only of the component, but of the project as a whole. It was a major shortcoming that corrective measures were not taken when the vital cooperation with other programmes did not materialise. Although the issue was raised at the mid-term review, those in a position to act or promote action, - including PCO, MOFA, the National Programme Steering Committee, the World Bank and IFAD - did so inadequately.

81. A socio-economic analysis of the marketing, processing and utilisation of root and tuber crops, including marketing channels, in Ghana was commissioned in 2000. This study was to include determining marketing margins, evaluating the role of marketing agents, and identifying key factors influencing the marketing of root and tuber crops. It was also envisaged to identify existing and potential uses of root and tuber crops and to determine how to promote increased utilisation of the crops. Furthermore, a profitability analysis of various traditional and improved processing techniques was to be carried out. Such research findings could have provided valuable information and guidance for the future orientation of the project as well as specific training of target groups. However, the draft report received by PCO was unsatisfactory and was not later improved.

82. To-date, the project records show that it has trained a total number of 1,531 MOFA staff, small-scale processors and bakers on cassava flour production, flour utilisation for bakery products and quality control. Six training modules have been prepared for processing of cassava into five products (gari, agbelima, chips, flour, starch). In addition, training on the use of sweet potatoes for traditional dishes was carried out for farmers in Upper East and Upper West Regions. There have been no similar training activities with regard to yam or cocoyam. Based on mission observations and findings from the BAS it can be assumed that only in a very few cases participants were actually able to apply what

they learned. Farmers stated by that they would prefer to sell their produce to a flour processor, instead of themselves getting involved in the cumbersome process of flour production. The assumption made by the PAR that resource-poor farmers want to become processors to benefit from the increased cassava yields by adding value to their produce may actually not be correct in all cases. A systematic follow-up or training impact assessment by the project is missing.

83. In addition to the awareness creation programmes carried out under the Community Support and Mobilisation Component, the project participated in a number of exhibitions and trade fairs, promoting cassava and sweet potato based products as well as cassava processing equipment. As a result of the campaigns the project noted increased requests by organisations and individuals for cassava flour and other products, processing equipment and protocols for setting up pilot plants. There is evidence that in some areas the demand for cassava flour by bakers as a result of the training by far exceeds the supply, while in other areas groups, which started producing, were not able to find a buyer and consequently discontinued production. This clearly shows the importance of careful analysis of the supply and demand situation prior to interventions by the project. In addition, there is a need for a facilitator to foster market development, a role that the project could and should have played.

84. To summarise, achievements under this component have been marginal. Post-production and marketing issues were never given the required attention. First budget allocations, albeit insufficient, were made in PY 3. The component is still not reflected in the overall project logical framework. The shortage of funds was aggravated by the missing technical expertise in the project to plan, co-ordinate and supervise the implementation. Despite stress on the importance of the component during mid-term review and the creation of a Post-production and Marketing Specialist position in the PCO (still not filled), the overall situation has not changed.



Producing Gari: before the cassava is left to ferment for up to 24 hours (which gives gari its particular acidic taste) pressing (dehydration) the cassava mash is indispensable.

IFAD photo by Sarah Mader

85. The activities planned for market research, training, adaptive research concerning processing and marketing-related issues, as well as technology development and dissemination were relevant. But the effectiveness of the interventions under the PPMC was seriously hampered by the lack of a holistic approach linking the various activities and by insufficient co-operation with VIP. The group approach to processing needs to be reviewed as groups may not always be the most effective and appropriate channel for promoting commercially viable enterprises. The component was seriously under-funded with less than 2% of total project expenditure. These resources were spent rather efficiently, with the exception of some market research, which produced no tangible outputs.

Programme Management and Co-ordination

86. As per the PAR, PCO was set up within the Crop Services Department of the Technical Services Directorate in Kumasi to assume overall supervision and ensure continuation of programme implementation. The full integration of the RTIP into the on-going activities of MOFA has been very appropriate, as it is a condition for continuity. In general, implementation and supervision of programme activities have been very well handled by PCO. Although the RTIP was to cover at least four crops, only cassava and sweet potatoes have been promoted. This was mainly due to the fact that improved planting material was available rather than an omission and with the advent of some new cocoyam planting material RTIP plans to increase efforts on this crop in the remaining implementation period. Given the demand for cassava planting material, this concentration is understandable.

87. Linkages with most relevant institutions have been established and maintained. M&E and MIS activities have been properly started, and most activities at field level have been recorded accordingly. However, concentration on input-output issues, financial flows and other operational issues prevented PCO from adequately monitoring the impact of programme activities. The late commissioning of baseline studies, the very poor quality of the respective surveys and their late submission by the responsible institutions combined to prevent PCO, MOFA and others to identify needs ex-ante and to assess progress and impact ex-post.

88. Concentration by the PCO on multiplication and distribution of planting material, has led to the relative neglect of IPM and adaptive research, post-production and marketing issues. Similarly, concentration on agronomic issues and approaches has led to the neglect of issues of financial and economic viability. Finally, socio-economic issues and farmer interests related to the choice of planting material have only emerged late in programme implementation as key issues.

89. A range of diverse and at times complex linkages, across the whole of Ghana has been necessary for the effective implementation of RTIP. Each component of the project has its own set of linkages and issues. PCO established effective working relationships with District Assemblies, MOFA district level staff, research institutes, plant protection and regulatory services, Ghana Seed Inspection Division, farmer groups and farmers. The adaptive research component is a good example of the importance of creating linkages to ensure a broad geographic coverage of issues and bring together different skills. The successful development of these linkages has been a significant PCO achievement. The annual research workshops have contributed to the sharing of experiences and a common agenda. Such a complex multi-partner set of research activities has not been without occasional problems, but the overall impression is good.

IV. PERFORMANCE OF THE PROJECT

A. Effectiveness

90. The overall objective of the RTIP was to “enhance the food security and improve the income of resource-poor farmers by facilitating access to new but proven locally adapted technologies for root and tuber crops”. This dual objective – food security and income increases – was to be measured through three indicators, the number of beneficiaries reached (720 000 by the end of the project), the calorie intake of beneficiaries during the lean season (+15% calorie consumption) and household income (+15%)³⁰.

91. As regards the first indicator, it is probable that RTIP will reach its targeted 720 000 farmers by the time it closes. As at mid-2003, some 1.5 years before closure, RTIP had reached a cumulative total of almost 120 000 farmers with improved planting material of root and tuber crops, namely cassava and sweet potatoes. However, it can be assumed that there was significant ‘leakage’ of planting material not captured by the monitoring system. Moreover, provided that distribution continues over the next 1.5 years, that farmers continue giving away part of their improved material to other farmers as they have in the past, and that they remain interested in the new varieties the expected levels of outreach should be achieved.³¹

92. As regards the second indicator on food security, there is no data that would allow the evaluation team to determine RTIP’s effectiveness with respect to calorie intake or to determine whether food intake in the lean season changed in any way. Nonetheless, new cassava and sweet potato varieties did lead to higher yields and output levels, which would have permitted a higher consumption at the household level during periods of food shortage. And, in theory, decreasing prices of cassava products will have benefited rural and urban consumers. The BAS recorded the opinion of 78% of farmers that household food security had improved since 2000. Yet it should be noted that only 18% of respondents attributed this to RTIP.

93. As regards the third indicator on income, there is no conclusive data or study that documents whether expected changes have taken place.³² As yields and output levels increased farmers should have been able to reach higher income levels as they would have been in a position to sell a higher proportion of that total output. However, this may well have been offset somewhat by the decline in prices since 2001, especially considering the reportedly lower market prices offered for RTIP varieties. Other factors also need to be taken into consideration. For example, local inflation was 65% during the period January 2001 to May 2003. In addition, to achieve higher yields with the new varieties farmers would have had to incur increased production costs. Finally, it is important to note that cassava sales generally make up a limited share of total household revenue. Taking all of the above into consideration, the evaluation team considers that real income increases, if any, will have been below the 15% target set in the logical framework.

94. RTIP effectiveness in “developing the planting materials multiplication system for root and tuber crops in order to increase the availability and adoption of new varieties by smallholders” through the PMMD component was to be measured through three indicators. A total of 700 000 smallholders were to have adopted new cassava varieties by PY6. Some 20 000 smallholders were to have adopted

³⁰ A summary table containing the key result areas or objectives, indicators and results achieved is presented in Appendix 3.

³¹ The evaluation team obtained some responses of tertiary multiplying farmers on the number of farmers to whom they gave some planting material. This was in the range of 1-8 in the case of cassava and 3-50 in the case of sweet potato growers. The BAS also found that 80% of secondary and tertiary multipliers actually distributed planting materials to neighbours, friends and relatives. Of these, 71% distributed up to 10 bundles, 10% 11-20 bundles, and 19% above 21 bundles.

³² PCO has indicated that farmer incomes may be up to 10.2 times higher when cultivating improved varieties as compared with traditional ones. However, the evaluation team believes that the probability that such increases are realisable by target group farmers is low given that such estimates have been drawn from the study of secondary multipliers. As such they do not reflect the production costs, yields, output levels and output prices faced by ordinary farmers.

new sweet potato varieties. And, average yields of adopting farmers were to increase by 40% for cassava and 30% for sweet potato. So far total of only 104 777 farmers have adopted new cassava varieties. However, under the assumptions listed above the evaluation team considers it likely that RTIP may effectively reach this target by the end of the project. At present, 14 495 farmers have adopted new sweet potato varieties. Hence there is a high probability that RTIP will be effective in reaching its 20 000 farmer target for that crop. With respect to yields, a study on cassava yields undertaken in 2002 confirmed that secondary multiplier farmers increased their yields on average by 106%³³. In 2001, only 65% of the districts surveyed recorded average yield increases of at least 40% as envisaged. Sweet potato growers met by the evaluation team stated that they obtained higher yields from the new varieties. However, there are no studies to show the extent of such increases.

95. RTIP effectiveness in “developing the Integrated Pest Management System to reduce field and post harvest losses and increase smallholder root and tuber crop productivity” through the IPM component was to be measured by a 20% decrease of production losses due to pests and diseases at project end. Selected studies revealed a reduction of local infestations, ranging from 15% - 73%. However, this component has included many different activities in various sites whose effects and impacts have not been studied by the PCO. The evaluation team found that farmers participating in FFS and experimentation were quite satisfied with the level of reduction of infestations, but that they were not aware of the extent of production loss reductions. The effectiveness of the IPM component was also to be indicated by a progressive reduction in average storage loss of cassava and sweet potato due to borers and weevils by 50%. This has not been monitored at all by RTIP and thus the evaluation team is unable to assess its effectiveness in this respect.

96. The RTIP Adaptive Research component aimed to be effective in “strengthening the adaptive research system for root and tuber crops in order to increase the flow of new technologies available to farmers, including women: collect, evaluate and conserve root and tuber germplasm in order to help in conserving the rich plant biodiversity of Ghana”. The first indicator of effectiveness in this respect was to be an increase by at least five of the number of research staff working on root and tubers by PY2. This has apparently been accomplished with the employment of at least nine additional scientists at the various research institutions and the several post-graduate students that have completed studies on root and tubers with RTIP fellowships.

97. RTIP was to release at least 15 new varieties by the end of the project³⁴. So far, five new varieties of cassava have been released through RTIP in collaboration with implementing agencies. Three of them (‘Eskamaye’, ‘Nyerikobga’ and ‘Filindiakong’) were released by the National Varietal Release Committee (NVRC) on 31 October 2002. The other two varieties (‘IFAD’ and ‘Nkabom’), which have been given official sanction by the NVRC on 22 August 2003, are selections from local germplasm collected at the inception of the RTIP. In addition to the two sweet potato varieties already released, another one (Teksantom) was released recently in May 2003. Plans for releases of more new varieties comprise two for cassava and four for yam, both in 2004. In addition, five new sweet potato varieties are in advanced stage, and preparations for cocoyam releases have been undertaken.

³³ MOFA, RTIP: Report on Survey on Area, Yields and Profitability of the Cultivation on Improved Cassava Varieties at Secondary Multiplication Sites Established in 2000 and 2001. Kumasi, December 2002.

³⁴ Three new varieties each released for cassava, sweet potatoes, sanitised sweet potatoes, cocoyam and Fra-fra potatoes plus five other new technologies (soil fertility management, cocoyam and Fra-fra agronomy, yam minisett and husbandry, sweet potato storage etc.) should have been tested on-farm and found adoptable by smallholders by PY 6.



Producing Gari: heat drying / roasting the cassava on stoves, specially constructed for the purpose, is the final step in the process of producing Gari. It is then ready to be eaten as a snack or stored for future consumption.

IFAD photo by Sarah Mader

98. RTIP was also to double the number of germplasm accessions and increase by 100% the range of root and tuber crops in the germplasm collection. In terms of germplasm accessions, root and tuber accessions in national collection increased by 100% in the case of fra-fra potato and Colocasia, 80% in the case of yam and 40% in the case of cassava. Collection has however been temporarily suspended to permit more focus on characterisation of accessions.

99. RTIP aimed at “empowering resource-poor farmers, farmer groups and rural communities including women to ensure unimpeded access to improved root and tuber technologies” through the Community Support

and Mobilisation Component. By the end of the project, RTIP was to have trained 24 000 farmer groups (at least 30% women) who would be participating in root and tuber extension activities by PY6. By mid-2003, 9 822 groups had been formed, of whose members women comprised 39%. Of the total groups formed some 7 477 were participating in root and tuber extension activities at the time of the evaluation. Beyond a few relatively well-functioning FFSs, the groups do not appear to function as groups as such, but they have served as vehicles for dissemination of materials and knowledge.

B. Efficiency

100. The efficiency of RTIP could be assessed from a number of different perspectives. One perspective is the relative efficiency of the investment, or the rate of return of the investment in terms of the benefits that it generated vis-à-vis its costs. Some comment can also be made on the efficiency of RTIP management. Likewise, there is scope for evaluating the efficiency of the operations, work processes and systems that were put in place in implementing institutions during the course of project implementation.

101. At a total programme cost of USD 10 million over a six year period, the cost per beneficiary household will be approximately USD 14 per household once the full target of 720 000 households have been reached. Direct economic benefits that could be quantified against these costs would include: i) improved food security for households that adopt improved varieties of roots or tubers; ii) lower consumer prices for root and tuber products; iii) substantial income increases for the 1 177 producer households participating in RTIP as secondary multipliers; and, iv) marginal income increases for ordinary farmers. Other economic benefits to the country’s economy attributable to RTIP could eventually include: i) increased potential to export cassava; ii) stimulation of low cost supply of cassava for local agro-processing industries such as starch and flour; iii) decreased dependency on imported wheat flour. Data that would allow quantification of those benefits and direct comparison

with the costs of this investment or the benefits of other public sector investments of similar sizes investments in Ghana were not readily available to the evaluation team, nor did time permit their collection. However, at minimum, it would appear safe to assume a positive return on the investment.

102. There have been no significant cost over-runs, nor are there likely to be time over-runs. Hence, using these most basic indicators, project management can be considered to have been efficient.

103. In addition, the implementation of RTIP has certainly increased the efficiency of the work being done by the disparate institutions with mandates to work on some aspect of root and tuber crops. It has done this by bringing these institutions together through increased sharing of information and coordination of their efforts. There are indications that the greater contact and exchange of knowledge between institutions and their staff members has made them more productive, leading to the more efficient use of scarce resources than would have been the case in the “without project” situation. Further, within institutions, in particular MOFA, RTIP fostered a more rigorous approach to the multiplication and distribution of new varieties of root and tuber crop, institutionalising a more efficient process than that previously undertaken by the ministry.

V. IMPACT ON RURAL POVERTY

A. Impact on Physical and Financial Assets

104. From this impact domain, only the question of RTIP's impact on financial assets is directly relevant.³⁵ Direct beneficiaries upon which RTIP has had an impact in terms of financial assets to date have included a few thousand secondary multipliers who were able to derive some income increases from the multiplication agreements and the increased yields. The majority of BAS respondents (55%) stated that they had increased their income, and 44% stated that this additional income helped them to buy some household assets and better finance the school education of their children³⁶. Altogether secondary multipliers and participants in FFSs amount to about 3000 households. Other presumed beneficiaries on whose financial assets RTIP would have had an impact include some 14 500 sweet potato producers and consumers of root and tuber crops experiencing declining prices over the past 2.5 years. No information is available as regards the extent of their reduced expenses for food, and the use of these savings or other multiplier effects in the local economies.

B. Impact on Human Assets

105. Two indicators from the human assets domain of the impact matrix were relevant to RTIP. They were access to information and changes in the workload of women and children.³⁷ The evaluation team assessed RTIP as having had a very positive impact with regards to increased knowledge and skills at farmer level and among extension officers. Since the beginning of the programme, PCO organised and funded numerous training sessions for regional and district officers, other relevant government staff, NGOs, and production and processing groups of roots and tuber products. The evaluation on the effectiveness of training activities on beneficiaries, carried out by RTIP, concluded that RTIP/CRI courses were perceived as relevant for participants, and that most of the acquired knowledge and skills on improved cultivation methods have been applied. Female and male farmers enhanced their knowledge and skills in production practices, pest management and to a much lesser degree on preservation, processing and utilisation of roots and tubers. MOFA field staff and NGO staff enhanced their knowledge and skills in group formation, gender sensitivity, participatory methods, communication and animation. The development of action plans by trainees during the training contributed to the success of training. Recently RTIP-funded courses for MOFA staff, bakers, caterers, students and farmers enhanced knowledge and skills in the processing of cassava into gari, starch, chips, flour and "agbelima", cassava processing equipment, hygiene, baking and cyanide contents and removal in cassava. However, much of the training on the utilisation of cassava flour for baking was premature as there is insufficient flour in the market. A one-week training course on socio-economic issues was provided to agronomists and biologists, however evidence of the impact of such training is scant.

106. The training under the IPM component equipped AEAs to run the FFSs. The programme used the FFS concept as a forum for participatory bottom-up extension, introducing IPM practices on roots and tubers and to enhance the capacity of extension staff in a new extension approach. Although a FFS with its 15 months duration (about 35 half days) is an intensive and time-consuming learning exercise, the concept has raised increasing interest among farmers and ministry staff. Although the relative costs of this extension approach have not been analyzed in detail, it has proved to be an effective extension approach making an impact on the 600-700 farmers who participated.

³⁵ For all intents and purposes the other impact matrix questions in this domain that are part of the IFAD methodological framework for project evaluation including, impact on household physical assets, impact on the infrastructure and physical access to markets, and impact on financial were not relevant as they were not among RTIP's direct goals.

³⁶ Respondents were predominantly secondary multipliers and participants in FFSs.

³⁷ The other matrix impact questions in this impact domain that are part of the IFAD methodological framework for project evaluation including impact on: access to potable water; access to health services; incidence of HIV infection; incidence of maternal mortality; access to primary school education; or primary school enrolment for girls, were not part of the RTIPs direct goals.

The project design intended to reduce women's work burden through the introduction of time saving technologies. An unknown, very small number of women processors have been assisted in accessing processing equipment (grater, press, stove), which substantially reduced health hazards from smoke and marginally reduced labor inputs. However, increased yields also mean more production and processing work. The workload of farmers in cultivation, mainly of women as farm laborers and processors, has significantly increased, however the women and men met by the evaluation team do not perceive this as a constraint provided their income increases.

C. Impact on Social Capital and Empowerment

107. RTIP was designed to have an impact in several areas of the social capital impact domain. These include people's organisations and institutions, social cohesion and self-help capacity, gender equity and women's conditions and empowerment vis-à-vis the market place. RTIP did not systematically monitor and evaluate social and qualitative aspects of programme impacts making it difficult to assess them with precision. However, the evaluation mission team concludes that overall impact on social capital has been negligible.

108. *People's organisations and social cohesion.* The project formed and/or strengthened a total of some 9 820 production and processing/marketing groups. Field monitoring of groups formed revealed that the institutional capacity and performance level of most groups is rather low, with stronger cohesion among the small number of processing/marketing groups than among the large number of production groups. As noted producer groups were formed only on the basis of their interest to obtain and multiply planting material. Their lack of cohesion and limited appreciation of RTIP strategies raises the probability that most groups will not survive the planting material multiplication and distribution phases. Cohesion, and likely sustainability is higher among more mature, visionary and commercially minded processing groups and the few FFSs than among tertiary multiplier/production groups. However, even these groups have not been able to develop strong links with cassava traders, processors or other external partners.

109. *Gender equity and women's conditions.* RTIP has not systematically recorded or analyzed gender-disaggregated data, nor has it monitored the changes with regard to women's socio-economic position. No explicit interventions such as gender sensitisation campaigns were taken at the community level. Further, given that financial returns from the sale of products are low due to the falling cassava prices, it would be difficult to assert that the programme substantially improved women's income or financial independence. Progress made towards gender equality and women's empowerment, if any, during the RTIP implementation period cannot be attributed to project. Despite recent efforts to reach more women by intensifying the collaboration with NGOs and religious bodies, RTIP cannot be considered to have had an impact on gender equity or women's conditions. More information on this is found in part 4.6 below.

110. *Empowerment.* Empowerment of producers vis-à-vis the market has never been a stated objective of the project. Although the project aimed at improving access of resource-poor farmers to improved post-production technologies, access to technologies alone does not automatically empower farmers to market their products. In this regard, the introduction of the improved varieties may have actually had a negative impact. The fact that some of the improved varieties are not suitable for local consumption and do not store well in the ground for longer periods reduces both the size of the market and farmers' flexibility to sell at times when demand and consequently prices are highest. In those few cases in which pilot plant processing groups and processors trained on the production of cassava flour were able to market their product, the impact was certainly positive. However, in the absence of a systematic approach towards training on marketing skills and linking producers, traders and commercial processors, the project has contributed very little to empowering producers vis-à-vis the market.

111. There have been some opportunities for participation for farmers at various levels. As the BAS has shown, intensity of interaction between farmers and AEAs substantially improved due to RTIP. This applies in particular to FFSs, but also to most secondary farmers. Some farmers had the

opportunity to participate in on-farm research. However, these few opportunities did not lead to empowerment on any significant scale. In the majority of cases, when the new varieties were distributed, farmers got what was available without any meaningful chance for dialogue as to what they needed or wanted. Indeed many producers felt helpless rather than empowered vis-à-vis markets as they faced declining prices resulting from surplus output levels.

D. Impact on Food Security

112. All five indicators from the food security impact domain are relevant for RTIP. The project was designed to have an impact on nutritional status, household food security, farming technology and practices, frequency of food shortage and agricultural production.

113. *Nutritional status of children.* By design, RTIP aimed at enhancing calorie intake during lean season by 15% and intended to promote the consumption of vitamin A rich sweet potato and leaves of root crops. However, during implementation, no attempt has been made to actively address issues related to nutrition in research and extension. Changes in children's eating habits, frequency of eating, or other aspects of childcare have not been monitored.



Gari – the end product looking something like semolina or *cous cous*. It is easily stored and women sell it at the local market by the cupful.
IFAD photo by Andrew Westby

114. In line with the PAR, RTIP focused its assistance on the quantitative aspect of household food security, largely disregarding qualitative aspects throughout the programme cycle. While the evaluation team considers that nutritional effects are likely to have been marginally positive in the case of sweet potato growers, who may consume about 30-50% of their production, the same does not hold for cassava. Cassava yields 2-3 times more energy per area unit than cereal and leguminous food crops and is often referred to as “insurance crop”, providing food when other crops fail due to diseases or draught. However, it is a nutritionally poor food that needs to be complemented by protein-rich

food in order to obtain a balanced diet. Furthermore, the consumption of certain cassava varieties with ingested cyanide can enhance iodine deficiency, which in turn can cause goitre and cretinism, among others. Hence increased availability of cassava is unlikely to have improved nutritional status except where farmers used it to increase total caloric intake but did not substitute it for other more nutritious foods. It is not certain that this would often have been the case, especially considering the BAS finding that a number of farmers reduced the area cultivated with maize, vegetables or other crops as a result of expanding cassava cultivation. On balance, the evaluation team assessment is that RTIP has had no net positive impact on the nutritional status of adults or children.

115. *Household food security and food shortage.* RTIP's expected impact in this respect was to increase caloric intake of the 720 000 beneficiaries by 15% during the lean season. It is estimated that adoption of improved varieties by resource-poor farmers on average resulted in yield increases of 30%, which may go up to 40-60% where farmers also apply recommended agronomic practices. The

evaluation team considers that as a result of increased output about 80 000 people, that is roughly 70-80% of the 100 000 who have been effectively reached by RTIP so far, will have substantially improved food security. This is rated as highly likely to be sustained. However, only some 3 000 people are likely to have improved food security as a result of increased income.

116. *Farming technology, practices and agricultural production.* Before RTIP, participating farmers used their own varieties, which were lower yielding. In addition, planting methods were different. In the case of cassava, farmers used longer and unhealthy planting material and planted at sub-optimum densities and in a random manner in their fields. Under the programme, farmers now use shorter cuttings with about 5 nodes (about 20 cm length) as compared to 12 nodes (about 40 cm length) previously, plant in rows and at optimum densities. In addition, at the Farmer Field Schools and on demonstration farms, farmers have acquired knowledge concerning agronomic practices and in the control of diseases and pests among others and applied the knowledge on their farms. A good example is the control of the cassava root rot disease. In the past, after uprooting farms, farmers scattered the infected roots in their fields because they had no knowledge on the mode of spreading of the disease. Today, they rogue out such plants and avoid contact of infected plants with their fields.

117. RTIP has been quite successful in elaborating and disseminating packages of cassava and sweet potato cultivation. These comprise those known techniques of cultivation, which have the best impact on production output (e.g. varietal selection, selection of planting site, soil preparation, planting, spacing, soil fertility management and weeding) as well as some newly tested techniques to improve soil fertility management and reduce weeding. Storage and treatment of planting material as well as planting techniques for both cassava and sweet potatoes have also received a lot of attention, and techniques spread to farmers via the extension service. However, this has not been the case for farming techniques for cocoyam and yam.

118. Overall, the evaluation team estimates, as with the food security question, that RTIP will have had an impact on the farming technology and practices of some 80 000 farmers or roughly 70-80% of the 100 000 who have been effectively reached by RTIP so far, not to mention the impact on the 3000 secondary multipliers and participants in the intensive FFSs. RTIP's impact on farm technology and practices is rated as substantial and highly likely to be sustained. The same holds for RTIP's impact on agricultural production.

E. Impact on the Environment and Communal Resource Base

119. RTIP as designed was not expected to have any significant impact in this domain on the natural resource base or on exposure to environmental risks. However, its implementation did have a modest negative impact on soil nutrition and cyanide exposure that is considered likely to be sustained unless corrective measures are taken.

120. *Natural resource base status.* Root and tuber crops are efficient at removing nutrients from the soil. This is due to the high nutrient intake and the relatively long maturity period of some of them compared to other food crops. Soils on which they are intensively cultivated are, therefore, likely to have low fertility. This results in yield losses over the years. While RTIP made some attempts to elaborate and disseminate new techniques of soil fertility management, apparently very few farmers have adopted any of these. Therefore, the use of improved varieties by over 100,000 farmers under the RTIP will have had a negative impact on the natural resource base status of participating farmers.

121. *Exposure to environmental risks.* By introducing successful IPM solutions to pest control, RTIP avoided exposing participating farmers to the environmental risks posed by pesticides and other agricultural chemicals.

122. On the other hand, gari processing is associated with volatilisation of hydrogen cyanide and inhalation of cyanogenic compounds. Stoves have been introduced that are supposed to contribute to reducing this problem. Care is also needed in the disposal of liquid waste from cassava processing since this can be polluting. In fact, RTIP has directly supported the PSI and its Ayensu Starch Company factory that does not have proper systems in place yet for treating the effluent from

processing. The negative impact this activity has on the environment needs to be resolved. For the rest, as foreseen at Appraisal, processing activities were on a small scale and dispersed, hence any negative impact they may have had on the environment was very limited.

123. Further, there needs to be an urgent review of the cyanogen contents of specific products made from specific varieties of cassava. Very little data of this type could be located because of problems carrying out the analysis of cyanogen in Ghanaian laboratories. An analysis of dried cassava chips of 2-3cm dried for 3 days in a solar drier made from various varieties of cassava, including those being distributed by RTIP, was made by KNUST as part of a project sponsored by a commercial concern. The most common variety, Afisiafii, produced a product with 15.96 mg/100g (159.6 ng/kg) HCN equivalent on a dry matter basis. This is 16 times greater than the FAO/WHO Codex recommended limit of 10 mg/kg for cassava flour. The RTIP recommended method of flour processing is different to that used by KNUST and involves grating which should render the product safer, but this needs to be confirmed. Consideration should be given as to whether the promotion of rapidly dried konkonte is appropriate with the newly introduced varieties. Rapidly dried konkonte is more like the flour produced by KNUST.

F. Impact on Institutions, Policies and the Regulatory Framework

124. RTIP set out to make an impact in only one area of this impact domain, local public institutions and service provision. Overall impact in this area has been rated modest, but unlikely to be sustained. During implementation RTIP has activated the extension service in the 76 districts it supports. AEAs were to visit farmers more frequently. In the case of the FFSs, this led to about 40 contacts over a period of 15-16 months along a pre-defined schedule. The BAS found that 77% of respondents had been visited at least once a month, while 13% had been visited 'rarely' and 11% 'never'³⁸. This has been achieved because AEAs had a more intensive work plan, were paid incentives and tightly monitored. It is likely that this intensity of interaction will decline when RTIP closes. Yet field discussions reveal that farmers are now more aware of channels of communication to AEAs, services they can provide, and ways to request them. Many farmers indeed confirmed their current disposition to request direct on-site assistance by AEAs more frequently as needed. As for AEAs, many have improved their knowledge of participatory extension methods and are likely to continue to apply them. On the other hand, at higher levels the civil service in MOFA is still far from being a fully participatory service provider.

G. Impacts on Gender

125. The RTIP logical framework states that at least 30% of farmers trained and participating in root and tuber extension activities should be women by PY 6. Women were expected to benefit from the programme significantly insofar they are primarily responsible for processing of root and tuber products. The RTIP design assumed a reduction in the workload associated with food-processing and off-road transport through the complementary VIP project, that would enhance women's ability to earn independent incomes. VIP was to provide a strong link with RTIP through the establishment of beneficiary groups that would benefit from both projects, in particular in post-harvest activities and small root and tuber processing businesses. The programme design aimed at increasing incomes by increasing women's productivity so as not to take additional time, sacrifice their children's welfare or compromise their health and nutritional status. Women were to be systematically encouraged and assisted to form community and group organisations and to plan, evaluate and implement activities to improve nutrition thus improving their household food security. A gender-sensitive analysis of nutrition and root and tuber production and processing was to identify entry points for programme interventions. The PAR foresaw a baseline survey that was to provide a better understanding of traditional household strategies for survival and for coping with food security problems. It also proposed gender sensitisation for front line staff in order to work more effectively with women.

³⁸ BAS, September 2003, p. 27, chapter 3.4.



Only a few farmers use the waste material from producing Gari for commercial purposes. The dried cassava peel can be processed into pig feed which is currently a profitable niche product on the national market.
IFAD photo by Sarah Mader

126. RTIP correctly identified appropriate gender differentiated opportunities in its emphasis on women's role in food processing. Yet, except for the 30% participation in extension activities, the logical framework did not provide gender-disaggregated performance and impact indicators. This would have helped monitor and evaluate progress made towards gender equity and women's empowerment. Another design weakness was that none of the PCO professional staff had formal responsibility for addressing gender issues. Further, the reliance on the VIP project to generate benefits for women proved unrealistic.

127. A detailed socio-economic and gender analysis undertaken at the appraisal stage would have assisted implementers to better understand particular constraints of women in different ethnic societies. This would have enabled the managers, researchers and extension officers identify concrete and appropriate operational measurements, research topics and planting material with specific characteristics, to ensure equitable access to programme services and benefits.

128. On the whole, women and men were given equal opportunity to access RTIP support. This is confirmed by the BAS finding that the proportion of males and females who had contacts with the staff of RTIP was about the same. However, the actual number of women who received improved cassava planting material for their individual garden plots and group farms from tertiary multipliers is not known. Instead, RTIP records do show that by mid-2003, women represented 39% of membership in production, processing and marketing groups created by RTIP. Representation of women in processing groups is assumed to have been higher than in production groups, given women's major role in processing and marketing activities. Had RTIP put more emphasis those questions women's overall participation in RTIP would have been higher.

129. At the early stage of the project, the World Bank raised the concern that socio-economic issues deserved more attention in the programme. The 2002 Implementation Support Mission, (ISM) report noted that the delivery mechanism for multiplication and distribution of planting material was adequate to reach farmers in general, but not for effectively reaching women in some cultures. The ISM report proposed further diversification of the planting material delivery paths to reach more resource-poor women. As a result, in 2002 RTIP intensified the collaboration with NGOs, religious bodies, and opinion leaders to reach poor rural women and sustain their access to RTIP services. Measures included, for example, activities to disseminate information on RTIP after church services and offering training on cassava processing and utilisation to women church groups.

130. Women's participation in RTIP as secondary and tertiary multipliers appears to have been lower than men's. This can be partially attributed to prevailing gender roles in ownership and usufruct rights in some societies. It can also be attributed to existing intra-household division of labor and

responsibility for specific productive and reproductive activities. Further, as only 20% of AEAs are women, the predominantly male extension service may have contributed to this.

131. RTIP's impact on women can be understood taking into consideration that most Ghanaian societies are patrilineal, where women do not inherit and own or control land. By and large men decide what type of crops shall be cultivated. Women are generally obliged to work on the husband's land. Men may provide their wife or wives with a small plot of land where they cultivate food crops, mostly for family consumption and sale in case of surplus. Many women met in Northern Ghana did not perceive it as their right or responsibility to become secondary or tertiary farmers for planting material multiplication. Hence, male farmers were at the forefront when AEAs approached communities to introduce the improved varieties. Several women farmers met by the evaluation team indicated that when they were informed about the programme, the planting material was already distributed among the mainly male community members.

132. RTIP shows signs of having an impact on gender based roles with respect to processing and marketing of cassava. With the presence of RTIP there would appear to be a shift in the role of cassava in the household livelihood system from a subsistence crop for food security during the early rainy season, to a cash crop and even industrial crop. Similarly, as the use of the crop is shifting from home consumption to sale, so – to a certain extent – are responsibilities for processing and appropriation of value-added through processing from women to men. With further commercialisation of cassava as a cash and industrial crop, women could lose an important source of income. Some attention by RTIP to this potentially negative impact of the project with respect to equity and gender is called for.

133. The impact of RTIPs adaptive research and IPM components on women is not known. However, women and men were found to have different preferences with regard to characteristics of planting material. Had RTIP considered the difference in needs and preferences by gender, it could have helped promote greater equity. By not taking them into consideration, RTIP's implicit impact on the development of new technologies or production practices has been to reinforce any existing gender biases.

H. Sustainability

134. The likely sustainability of RTIP's impact overall has been considered in relation to the positive impacts that it has had in each of the domains described above. As noted above, the sustainability of RTIPs impact on access to information, household food security, farming technology and practices, frequency of food shortages, and agricultural production for some 80 000 households is rated as highly likely. Sustainability of RTIP's impact in terms of financial assets for the 3000 households concerned was rated as likely. The sustainability of RTIP's impact on people's organisations and on local public institution service delivery were rated as unlikely.

135. Overall it is considered highly likely that the impact or benefits generated by RTIP will be maintained in the long run. This sustainability derives from the fact that RTIP has made permanent changes by transferring technology and knowledge. Such type of changes, once having been made, can reasonably be expected to persist whether or not the government or donor-funded programmes that accomplished them continue to function. So the benefits that result from the changes persist also. RTIP has also made some changes, albeit modest, in social capital and institutions. These are more tenuous and unlikely to be sustained for two reasons. Firstly, this is because RTIP, by design, put less effort into these areas. Secondly, it is because they depend on the persistence of enabling environments, beyond the control of RTIP, that may or may not persist when project funding stops at project closure.

136. The food security and income impacts of RTIP could potentially increase in the long term if the absorptive capacity of markets increases and farmer marketing skills improve. This will be conditioned by the development of production costs (labor, organic and inorganic fertiliser, capital) price levels and the nature of expansion in the sector in terms of the transformation of root and tuber crops into various food products and other industrial products in micro- and small-scale industries. For poor farmers to capture those potential benefits they will require, among other things: (i) adequate

advisory services on the equipment and processing technology; (ii) better household and village level management skills; (iii) access to medium-term loans and capital formation for processors; (iv) further diversification of the cassava and sweet potato varieties; (v) adequate market information; and, (vi) consumer care (hygiene, packaging). None of these conditions in sector development are likely to be realised without well planned support by government and others.

I. Innovation and Replicability/Scaling Up

137. The design of RTIP, nation-wide in scope with a focus on one commodity, was itself an *innovation* at a time when the lion's share of IFAD financing was going to area-based rural development projects, irrigation and rural finance. Further, the RTIP design responds to the identification of roots and tubers as "poor man's" commodities. The assumption that by supporting the development of these crops RTIP would benefit the poor people who grew them was innovative as an approach to poverty reduction. Yet it proved to be only partly true. The innovative choice to focus on a commodity was useful as far as it went, but it had limited impact on the levels of poverty of its producers in so far as it focussed primarily on production. Insufficient attention was given to the characteristics of new varieties in the light of the role of the selected crop in the economy of a resource poor household.

138. As a nation-wide project RTIP cannot be *up-scaled*, however it does offer some useful lessons with respect to *replicability*. In particular, RTIP's three tier planting materials multiplication and distribution system proved to be a successful one that merits consideration for replication in other crop improvement programmes. Furthermore, RTIP's development of an informal network whereby it exploited the knowledge and resources of a host of institutions and resource persons throughout the country provides a model that could and should be replicated by other projects and institutions.

J. Other Poverty Impact

139. Overall the evaluation team has assessed RTIP's impact in terms of changes in the lives of the rural poor as modest. While it has achieved substantial impact in some areas, that impact has been on a rather limited scale with respect to original targets. Moreover, this has been contrasted by modest or no impact in some areas and negative impact in still others. The main points with respect to the overall impact of RTIP on the questions covered in the six impact domains of the Methodological Framework for Project Evaluation are listed below:

- Improved processing technology and access to markets for about 300 poor women
- Improved income from sale of cassava and sweet potatoes for about 3 000 better-off secondary multipliers but minimal income increases for cassava growers due to falling prices
- Increased workload for all farmers applying recommended agronomic packages
- Improved access to information for up to 100,000 farmers
- Creation of almost 10 000 groups, although with mostly very low sustainability,
- Some limited improvements of household food security due to increased yields, although with some important limitations due to the characteristics of the new varieties,
- Some improved cultivation techniques for cassava and sweet potatoes and their packaging and dissemination
- Negative impact on soil fertility as farmers show no signs of applying soil fertility management techniques
- Higher than recommended cyanide contents in processed cassava in certain circumstances
- More frequent contacts with extension agents in the case of secondary multipliers and FFS participants.

VI. PERFORMANCE OF PARTNERS

A. Performance of IFAD

140. IFAD performed its basic roles and responsibilities as laid down in the Appraisal and Loan Agreement without any major problems. However, IFAD bears responsibility for conceptual weaknesses in the RTIP project design with respect to the relationships between food security and root and tuber crops and with respect to targeting. To its credit IFAD added intellectual and financial resources to implementation support provided by the cooperating institution. Nevertheless, it was unable to elicit an adequate response by RTIP to problems with the post-production and marketing component or help RTIP find ways to compensate for the missing support from the IFAD-funded VIP project. Loan administration functions are reported to have gone smoothly. RTIP benefited from the involvement of the IFAD Technical Advisory Division during the design stage, afterwards in the global initiative on root and tuber crops, and through assistance provided under an IFAD Technical Assistance Grant on processing of root and tuber crops in West Africa. IFAD's active promotion of networking among projects involved in root and tuber crops who are participating in that grant had a very positive effect.

B. Performance of the Cooperating Institution

141. The World Bank as Cooperating Institution (CI) performed well. Its strengths have been smooth loan administration, competent handling of procurement, good responsiveness to PCO needs and an innovative approach to implementation support. CI performance was weak in following up on project lacunae in monitoring and evaluating the impact of important activities and of the overall project goal, and in implementing the Post-Production and Marketing Component. There appears to be a tendency to become too involved in minor expenditure matters. This has led to excessive control and some redundancy given that the Annual Work Plan and Budget process is meant to provide the project with authorisation to incur and manage project level expenditures on agreed activity areas.

142. The CI undertook much of the supervision of RTIP using a team approach to Implementation Support Missions (ISM). These teams were composed of up to 20-25 representatives from the Government, IITA, RTIP, WB, and other agencies and institutions involved in the programme. They were divided into smaller subject matter teams for each programme. Over a period of 8-10 days, these teams visited program sites, communities, farmers, processors, staff and scientists of implementing agencies and other beneficiaries, and reviewed all programme components in terms of quantitative targets. This approach gave RTIP the benefit of a wide range of technical expertise. Applied in a participatory manner it furnished the project with good analyzes of RTIPs, progress and problems with suggestions for improvement. There were however two drawbacks to the process. One was that the large number of actors and views were reported cumbersome to coordinate and reports difficult to consolidate at times. The second drawback was that while the Task Team Leader assumed overall responsibility for RTIP support, follow up on ISM recommendations made by sub-teams for specific components was sometimes missing. Further, their membership varied.

C. Government and its Agencies (including project management)

143. Loan administration by government has been quite successful so far and all basic loan covenants have been adhered to. There have been some delays in releasing counterpart funds as per the loan agreement. However, in the light of the general budget constraints in Ghana at this time, differences between budgets approved and amounts subsequently disbursed were not very important³⁹.

144. The Steering Committee, MOFA generally, and Crop Services have supported RTIP as planned. However, as noted above they appear to have had a "technical" rather than "target group" based orientation. The importance of considering what would be most beneficial from the standpoint of the target group has been undervalued. As described above in part 3.16 on the performance of the

³⁹ Total budget approved for the period from 1999 to mid 2003 was 1675 million cedis, of which was disbursed so far 1550 million cedis equivalent to 93%. However, there has been a discrepancy between budgets submitted by PCO (5.15 billion cedis) and the amount approved.

Programme Management and Coordination and in part 3.2 on Effectiveness of the Project, the PCO has performed well in most regards, especially as concerns the core business of plant multiplication and dissemination, IPM and agronomic research, with the above noted exceptions. PCO has established a solid network of relevant institutions. As noted above, despite repeated follow up by IFAD and the CI, the post-production and marketing component was not given the prominent role it should have been. Admittedly, activities within this component would not normally have fallen within the mandate of the Crops Services Division. Nonetheless, as lead office it was responsible for overseeing RTIP in all its dimensions, not only those pertaining to its own area of technical expertise.

D. Performance of Non-government and other Organizations

145. RTIP has benefited considerably from the assistance provided to it from IITA. It has provided numerous services to RTIP, assisted in many technical issues and participated in all supervisory missions⁴⁰. Without IITA's very positive involvement in backstopping and assistance, the RTIP would not have achieved its current results.

146. The role of NGOs and CBOs in the programme has been limited, and only a few actually participated. Some rural development NGOs serving farmers actively participated in the distribution of planting material to their members and affiliates under ordinary terms and conditions. Since 2002, RTIP had made additional efforts to involve NGOs and religious bodies engaged in rural development to improve outreach to women where there had been socio-cultural barriers to effectively reach them. In all these cases, the NGOs and CBOs performed their responsibilities as agreed. Many who participated provided good outreach capacity and knowledge of local conditions.



Collaboration with research institutes in Ghana was an integral part of the programme. While designing this dryer (which uses sunlight) for cassava chips, the Food Research Institute in Ghana focused on its technical feasibility. However, the dryer proved too expensive for small farmers, processed too little in relation to its size and thus was not widely adopted by farmers.
IFAD photo by Sarah Mader

⁴⁰ To cite a few examples: IITA supplied RTIP with predators for insectaries, identified predators collected from the field, conducted several surveys with Ghanaians to determine the persistence of predators, assisted in a survey to determine the prevalence of a fungus disease that attacks mites, hosted several missions from Ghana related to IPM.

VII. OVERALL ASSESSMENT AND CONCLUSIONS

147. The implementation of RTIP has led to a number of very positive outcomes. It has stimulated an increasing interest in root and tuber crops in Ghana and even in West Africa. It has fostered the networking of scientists and promoters in the sub-region in dedicated efforts to elaborate cultivation packages and new varieties. It has achieved a co-ordinated research approach with improved transformation of research findings into concrete practices. RTIP has led to improvements in international competitiveness of Ghana in terms of cassava and sweet potato production while lowering consumer prices for cassava. It has released new varieties and created a functioning replicable system for their multiplication and distribution. It has upgraded the knowledge of the extension service and at least 100 000 farmers in 76 districts about root and tuber cultivation and integrated pest management methods. RTIP stands out as a rather well managed project with dedicated staff in the management team and throughout the international, national and local institutions that worked with them as partners, as attested to by these commendable achievements.

148. Therefore, although the evaluation team rated RTIP's overall impact on project beneficiaries as modest, it rates the project overall performance and impact on the sector generally as substantial. With carefully designed future investments to consolidate them, these achievements can be taken a step further to fully realise the potential they offer to reduce rural poverty. A critical look back at some of the underlying faults of the project design and implementation should help those responsible for the design of future investments, by IFAD or others.

149. RTIP's design was largely prompted by the fact that there were new high yielding varieties of cassava and sweet potatoes that merited rapid dissemination to farmers. It was built on the assumptions that: (i) most of the farmers who cultivated root and tuber crops are poor; (ii) if poor farmers were to adopt these new varieties they would increase their output; and finally, (iii) their increased output would lead to increases in their consumption and incomes. Four and a half years into programme implementation, it is evident that some of the assumptions were too simplistic or erroneous.

150. The evaluation found that it was correct to want to disseminate improved varieties to farmers and to assume that most farmers growing these crops are poor. However, it proved incorrect to assume that it would be the poor farmers who would readily adopt the newly improved varieties. The first and most successful adopters, not surprisingly, were the better off or less vulnerable farmers. They were the ones who had the land, labor and capital required to make recommended changes. More importantly, they were secure enough in terms of finances or food stocks to absorb any losses if the change did not bring positive results. To the extent that many of this better off group (including the secondary multipliers, the participants in farmer field schools and the commercial farmers supplying cassava for the PSI starch factory) have found adoption of the new varieties to be profitable, RTIP has set the stage for the next round to reach further towards the poor. At the moment RTIP has begun, but not fully accomplished, that outreach.

151. The next assumption underlying RTIP, that if poor farmers were to adopt improved varieties then they would increase their output, proved only partly true. Output, or rather yields obtained by poor farmers were higher. Yet, as one would expect, they were considerably less so than those achieved by researchers or by the limited number of secondary multipliers or farmer field school participants who received intensive support from RTIP. In some cases the lower yields achieved by resource poor farmers will have been due to the fact that they simply did not have the resources needed, especially labor, to reach higher yield levels. In some cases, it is probable that they chose not to apply the scarce resources that they did have to reach higher yields. Where the latter was the case, farmers' own cost/benefit calculations will have led them to give greater weight to factors other than their cassava yields when deciding whether to apply the full set of improved practices recommended by RTIP.

152. The final assumption, that increased output would lead to increased food security and increased incomes, proved wrong on several accounts. In order for increased output resulting from adoption of

new varieties to lead to increased food security the output would first of all have had to be suitable for consumption, as was not always the case. Secondly it would have had to have been available for consumption when needed, as was also not always the case. Alternatively, the increased output would have had to be transformed into income to allow the purchase of more or better quality food than had been available to the producer prior to the adoption or change in practices. As much discussed above, RTIP farmers were unable to transform increased output into increased income to purchase food or meet other basic needs as many found themselves simultaneously facing increasing production costs, weak demand and decreasing output process for their products.

153. Some of the reasons that these basic assumptions underlying the project design did not hold true can be partly attributed to how the project unfolded during implementation. Cognizant of the difficulties for poor farmers to adopt new varieties, RTIP took a number of steps to make materials accessible to them. The most consuming and certainly laudable effort of the project in this sense was the multiplication and dissemination programme to make materials physically available, free of charge, in the rural areas where poor farmers live. RTIP designed and delivered much farmer training, though it was only a fraction of what could have been done given RTIP's ambitious nationwide objectives. However, the lack of attention by RTIP to the match between the varieties disseminated and the needs of poorer farmers had negative consequences.

154. For example, some of the improved varieties introduced by RTIP with maturation periods of less than one year have the advantage that they yield faster returns allowing harvesting and selling the crop when other food crops are not yet in the market, consequently fetching higher prices. However, this can only be achieved if cassava is planted early in a season, which is unlikely because farmers prefer to plant cereal crops due to their higher dependence on rains. Further, most improved varieties can be stored in the ground for relatively shorter periods before incurring losses. Unless they can be processed, they must be consumed or sold. This reduces farmer flexibility in harvesting when food supplies are short or prices advantageous.

155. In the drive to multiply and disseminate the improved varieties whose availability gave the impetus to design the RTIP investment, farmers did not necessarily get what they needed. They got what was available, sometimes without understanding well the characteristics of the varieties they were planting and the consequences thereof. Some varieties promoted by RTIP were more suited to commercial than to subsistence farming. Others required processing before consumption that farmers did not undertake for their other varieties. Researchers, for good reasons, favoured the yield and disease resistance characteristics in the varieties developed. While this was necessary, it was not sufficient to bring expected benefits.

156. In more recent adaptive research RTIP has been more sensitive to the farmer perspective and the socio-economic issues that are important to crop development. Yet, apart from some on-farm trials, RTIP is still missing explicit mechanisms to involve resource poor farmers in setting research agenda that take into consideration their preferences with respect to consumption and processing, crop maturation periods, planting calendars, and in-soil storage capacity are still missing.

157. As noted throughout the report, the other most glaring weakness of RTIP's implementation that compounded incorrect assumptions in its design was the low level of importance it gave to finding ways to help farmers process and market their increase output. It is, in some sense, a mark of the success of RTIP that it provoked surpluses that led to falling output prices. Yet, RTIP's initial attention to production matters and the lag in its attention to processing and marketing matters was to the detriment of all.

158. These and other weaknesses in RTIPs implementation might have been corrected if management had given more attention to monitoring the achievement of its overall objectives and less to tracking inputs and outputs. Project partners identified many of the issues raised here during their review of RTIP at mid-term, but not enough was done to follow up their recommendations.

159. RTIP as an investment project was an unusual hybrid. As noted above, in many ways it was innovative, combining a MOFA interest in commodity development and an IFAD willingness to

finance reduction of rural poverty. The evaluation, ex post, shows that RTIP's success was in accomplishing the first of these tasks, and that its design was well suited to doing so. Yet the design did not include enough specific measures to make sure that it also accomplished the second. Experiences in RTIP implementation have put clearly into relief what those crucial missing measures were and what can be done to re-direct future efforts towards a compatible achievement of both ends.

VIII. INSIGHTS AND RECOMMENDATIONS

160. On the basis of the evaluation findings and conclusions, the IFAD Office of Evaluation recommends a number of actions for the remainder of the RTIP implementation period.

A. Recommendations for the Remainder of RTIP Implementation

161. Given the likely continued decline in prices in local markets and the difficulties farmers can be expected to have in marketing surplus output in local markets if the distribution of planting materials is continued at the current pace, it is recommended to reduce as soon as possible the secondary and tertiary arrangements with farmers to a minimum level, except in areas where there is a high demand for low-price cassava for large-scale processing. Under the current circumstances, this only applies to farmers supplying the Ayensu Starch Company. In other areas, normal farmer to farmer diffusion patterns should be sufficient for further dissemination of planting material, and the ordinary assistance provided to farmers through the extension service fully suffice to assist farmers who demand new varieties. Overall a more selective approach to multiplying and disseminating the recently released cassava varieties should be taken. Prior to defining that approach, an analysis should be done of the costs of multiplication and how to better match varieties multiplied to farmer needs and preferences.

162. RTIP should undertake to complete building works on the insectaries. In connection with the IPM component it should also distribute predators of LGB in known hotspot areas. RTIP should also commission a study of the economic impact of the current biological control before designing future IPM investments.

163. While the varietal release programme continues, there should be increased emphasis, even in on-going research programmes on financial and socio-economic economic analyzes of proposed interventions. In addition, production of extension materials needs to be stepped up and, if possible, a web-site should be commissioned to increase the availability of information generated to eventually include relevant information from other components.

164. To improve RTIP operations generally and to prepare for the next phase investment, RTIP should undertake a cost-benefit analyzes of alternative approaches to processing, comparison of the best set-up and scale for various village-based processing options and guidelines for processors. The same applies for assessments of markets, demand and prices for root and tuber crops and products, and a comparative analysis of individual and group managed food processing technologies.

165. Support to groups under the community support and mobilisation component should be concentrated on processing groups and addressing their specific requirements. In addition, in order to support the PSI further, RTIP should further study the demand for support of groups collaborating with the Ayensu Starch Company.

166. The recruitment of 1-2 officers in charge of the post-production and marketing component is long overdue. Staff recruited should develop a work plan in collaboration with colleagues working in adaptive research and community support that will begin efforts described below in the recommendations pertaining to an eventual Phase II.

167. The current M&E system would benefit from a thorough review to see where it can reduce the collection, generation and processing of data on physical and financial progress to the bare essentials. At the same time, it should review monitoring of current logframe indicators of RTIP performance and give greater thought to developing the work it has begun on evaluating impact at the household level and the use of participatory means to do so.

B. Recommendations for Future Investments

168. The Office of Evaluation supports a second phase investment to follow up and consolidate investments and activities that have been undertaken through RTIP to date. In relation to such an eventual investment by IFAD and to future investments by the Government of Ghana, it recommends the following:

169. Future investments by the Government of Ghana in support the development of particular crops, as in RTIP, should be designed to support the entire vertically integrated commodity chain with more balanced investments in each link of the chain.

170. Future IFAD investments in the development of root and tuber crops in Ghana should maintain improved food security and increased household incomes for the rural poor as their overall goals.

171. Assumptions about crop sector development and its impact on poor rural households should be carefully re-examined in the design and in the implementation of future investments.

172. Large-scale campaigns for the multiplication and dissemination of improved varieties should be used to reduce rural poverty only once socio-economic benefits to poor farmers who adopt improved materials have been assessed and only in cases where it is clear that the market can absorb a large supply response, as with the government PSI initiative.

173. Agricultural research and farmer field schools, or other extension activities, should be demanded. Farmer priorities must be routinely ascertained and given ample weight alongside technical and agricultural policy considerations.

174. A study should be undertaken of the comparative costs and benefits of farmer field schools versus those of normal extension practices at the district level before further investments are made in this approach.

175. To compensate for inadequate efforts in RTIP, future investments for reducing poverty through investment in root and tuber crops should emphasise post harvest production and marketing activities and the development of new market opportunities.

176. Among activities that should be considered for support are: (i) appraisal of technical and financial viability of existing processing equipment; (ii) training and advisory services on processing techniques; (iii) training on hygiene, health and environmental issues at processing sites; (iv) advisory services on packaging and labelling; (v) improved storage methods, (vi) regular dissemination by radio of price information; (vii) promotion of linkages between producers, processors, and traders on outputs and equipment (viii) elaboration of various financing models and arrangements with financial institutions to fund processing equipment and working capital requirements.

A. Background and Rationale

1. The Root and Tuber Improvement Programme (RTIP), financed by IFAD, became effective in January 1999 and is due to close in December 2004. The Government of Ghana, in collaboration with the IFAD Africa I Division, has indicated an interest in continuing to work together in this sector beyond December 2004. They have envisaged the possibility of a second-phase project to be financed by IFAD. According to IFAD procedures, if there is to be a second phase of any project, the first phase must be evaluated before design of the second phase begins. Evaluation of the on-going Root and Tuber Programme in the second half of 2003 would permit the evaluation results to be available for the eventual design of a phase II project in 2004, were a second phase to be agreed by all partners. This, in turn, would allow for the possibility of a smooth transition from phase I to phase II in 2005.
2. The overall project goal or objective is to enhance rural food security and incomes of resource-poor farmers through priority investments in technologies to improve the productivity of root and tuber crops (cassava, yams, cocoyams and sweet potatoes).
3. Specific objectives are: (a) to develop a sustainable system for the multiplication and distribution of improved planting materials for root and tuber crops; (b) to develop an integrated pest management system including biological control to reduce the incidence of pests and diseases; (c) to strengthen adaptive research system for root and tuber crops in order to increase the flow of new technologies available; and (d) to empower resource-poor farmers, including women, to ensure unimpeded access to improved root and tuber technology.

B. Objectives, Key Questions and Expected Outcome**Objectives**

4. The overall objective of the evaluation is to learn, together with partners, so as to improve the future performance of this and other related programmes.

Evaluation Areas, Criteria and Key Questions

5. The evaluation team will evaluate the following subjects, or aspects of the project, using the criteria indicated:

<u>Areas</u>	<u>Criteria</u>
Design of Project	relevance, innovation
Performance of Project	effectiveness, efficiency
Performance of Partners	effectiveness, efficiency
Impact of the Project on Rural Poverty	sustainability, replicability

6. In response to the interests of IFAD and IFAD's governing bodies, the evaluation team will evaluate the impact of the project on rural poverty in six specific domains. These impact domains are: i) financial and physical assets; ii) human assets; iii) social capital; iv) food security; v) environment; and vi) institutions and policies. The IFAD methodological framework includes a number of key questions pertaining to each of these impact domains.

7. In addition, the evaluation team will look into a number of key questions that have been identified by other partners to the evaluation. These include:

- What strategies has the programme used to target poorer members of communities? And how effective have they been in reaching those people?

- To what extent have increases in yields from newly adopted varieties resulted in increased incomes or increased food security for poor households?
- How successful has the programme been in choosing research topics, choosing researchers, ensuring farmer participation in research and linking research to extension?
- What agro-ecological zones have benefited most from the programme?

Expected Outcomes

The expected outcomes of the evaluation are:

- Analysis of the programme design, performance and impact and performance as compared with the initial and subsequently modified objectives as well as Annual Work Plans and Budgets
- Detailed responses to each of the key questions
- Recommendations to partners with respect to any future policies or future investment programmes financed by IFAD or others related to poverty reduction and the root and tuber sector
- The transmission of all conclusions and recommendations of the evaluation to the Core Learning Partnership
- A written agreement, called Agreement at Completion Point accepted by all members of the partnership, which states the conclusions drawn, recommendations adopted and actions envisaged for the future.

C. Partners

8. The evaluation will be guided by a small group of partners, referred to as the Core Learning Partnership, (CLP). The CLP will be composed of :

Mr. Kuweku Baah, Chief Director, MOFA
 Mr. Francis Ofori, Crops Services Director, MOFA
 Mr. C. D. Anyomi, External Resources Mobilisation, Ministry of Finance
 Mr. Owusu-Bennoah, DG for Fish & Agriculture, CSIR
 Mr. Akwasi Adjei Adjekum, National Programme Coordinator
 Mr. J.N.O. Azu, Technical Unit Coordinator, Opportunities Industrialisation Centre, (OIC)
 Mr. Yeboah Asuama, Farmer Wenchi District
 Ms. Habiba Yusif, AEA, Bibiani District
 Mr. William M. Wiafe, DDA, Assin District
 Ms. Patience Mensah, Task Team Leader, World Bank
 Mr. Mohamed Manssouri, Country Portfolio Manager
 Mr. Robert Asiedu, Plant Breeder, International Institute for Tropical Agriculture (IITA) IITA
 Mr. Douglas Wholey, Technical Advisor (Agronomy), IFAD
 Mr. Alessandro Meschinelli, Technical Advisor (Research), IFAD
 Mr. Nebambi Lutaladio, FAO

9. The roles and responsibilities of the Core Learning Partnership appear on page 6 of this appendix.

10. The evaluation team and the Core Learning Partnership will work within a broader partnership that will be invited to contribute to the analysis and reflections of the evaluation mission. This broader partnership comprises, individuals from the following organisations directly involved in project implementation:

- Crops Research Institute, (CRI)
- Food Research Institute, (FRI)

- Savannah Agricultural Research Institute, (SARI)
- Grains and Legumes Development Board, (GLDB)
- Plant Genetic Resources Centre, (PGRC)
- Biotechnology and Nuclear Agricultural Research Institute, (BNARI)
- Kwame Nkrumah University of Science and Technology, (KNUST)
- University of Ghana
- University of Cape Coast
- University of Development Studies
- President's Special Initiative, (PSI)
- International Institute for Tropical Agriculture (IITA)
- World Bank (Mr. Jean Delion, and the Water Sector Manager)
- IFAD Africa I Division, Director and Regional Economist
- IFAD Technical Division

11. In addition, the individuals from the following groups would also be considered members of the broader partnership:

- Project beneficiaries
- Staff of implementing agencies:
- Regional Directors of Agriculture
- District Directorates of Agriculture
- Agricultural Extension Agents
- Staff and Stakeholders of IFAD and other projects, REP, VIP, Rural Financial Services, AgSSIP,
- International development agencies and NGO including, inter alia, EU, FAO, GTZ, UNDP, OIC, ECASARD

D. Process and Methodology of the Evaluation

12. The evaluation process will include the following phases:

- Stock-taking of existing documents and knowledge: A first stock-taking exercise was undertaken by the Office of Evaluation through the review of existing documentation (Implementation support reports, Project progress reports, Back-to-Office reports from IFAD staff and a Mid-term review report). This was followed by a mission to Ghana by the responsible IFAD Evaluation Officer (Chase Palmeri), Evaluation Assistant (Mary Netto) and the Evaluation Team Leader (Michael Marx) 7-14 May 2003.
- Definition of key questions, expertise requires and modalities for filed work: During the preparatory mission meetings were held with various partners including project beneficiaries, project and implementing agency staff, staff from the ministries of agriculture and finance, the cooperation institution, members of the implementation support team, and the Minister of Agriculture. Partners helped to identify the key questions to be covered by the evaluation as well as the expertise needed to seek the responses to those questions. Also discussed were the composition of the core learning partnership, the proposed evaluation methodology, the composition of the main mission and the schedule of activities. These activities culminated in the redaction of this Approach Paper.
- Elaboration of the terms of reference and recruitment of consultants. Following the Approach Paper, the evaluation officer in charge shall draft the terms of reference of the mission. She will ensure that the contractual arrangements are made to allow the start of the mission around the end of July 2003.

- (d) Evaluation methodology and organization of field work. The methodology of the evaluation comprises the following main elements:
- a desk review by the Evaluation Team of all available reports and other documents produced by the programme, by the Cooperating Institution and by IFAD in relation to programme design, implementation and supervision or follow-up;
 - self-evaluations by key programme partners - including the PCO, the IFAD Country Portfolio Manager, and the World Bank Task Team Leader - who will evaluate their own performance and performance of their institutions using a format to be provided by the Evaluation Team prior to the Evaluation Team fieldwork;
 - review and analysis of the Beneficiary Assessment conducted by the programme with respect to IFAD key questions on poverty impact;
 - site visits to at least eight districts in four zones covered by the programme - to be selected by the Evaluation Team based upon criteria it sets taking into consideration, *inter alia*, those districts visited by the Beneficiary Assessment Study Team - to contact key informants and beneficiary groups to cross-check findings of desk review, self-evaluations and beneficiary assessments, especially with respect to impact on rural poverty;
 - validation of data and opinions collected in at least two zones – one producing cassava and one producing sweet potato - through beneficiary stakeholder meetings at district level including members of several communities;
 - meetings in Rome, Accra and elsewhere with participating institutions to cross-check findings from desk review and self-evaluations with respect to programme design, performance of the programme, and performance of partners;
 - local debriefing/validation sessions, during which the first results of the evaluation shall be presented to a wide range of inhabitants and local authorities, to be organised as seen fit by the Team Leader in consultation with the Programme Coordinator.
- (e) Presentation of the results and recommendations of the evaluation. A draft report of the evaluation shall be presented to all members of the key partnership in Ghana around 30 September 2003. Subsequent to this, IFAD shall organise a final consultation with the partners to present and discuss the evaluation results, recommendations and follow-up proposals. The members of the core learning partnership will discuss the results, recommendations and follow-up recommendations with a view to retain all essential elements in a final Agreement at Completion Point. The draft report and the Accord are also to be discussed with all interested parties/partners. The IFAD evaluation officer in charge shall finalize the report and the Agreement at Completion Point before distribution. Those who have participated in the evaluation process will be asked to evaluate the Evaluation Team and the overall results and impact of the evaluation generally.

E. Communications

13. The evaluation team will maintain good communication lines with the entire partnership members throughout the evaluation process. The following measures are adopted:

- Direct consultation with all partners prior to the decision on the evaluation approaches;
- Distribution of the Approach Paper to all members of the Core Learning Partnership, to be accompanied by an invitation to make comments;

- Briefing and debriefing of core partners and as many as possible members of the broad learning partnership before and after the field work;
- Participation of selected partners in the field work of the evaluation mission;
- Validation of the preliminary findings of the evaluation through one or more workshops for project staff and beneficiaries;
- Distribution of the draft report to all partners for comments;
- Organisation of a workshop with all partners to elaborate an Agreement at Completion Point, comprising the results achieved and the follow-up activities.

F. Work Plan

14. The schedule for the proposed evaluation activities is as follows:

16 June	Submit Approach Paper to Core Partners
1 July	Initiate Recruitment of Evaluation Team
20-25 July	Initiate full document review
26 July	Evaluation Team travel to Accra
27 July	Team preparations in Accra
28 July-12 Aug	Field Work
15 August	Presentation of Aide Memoire
15 October	Submit draft report to partners
15 November	Workshop for Agreement at Completion Point

Core Learning Partners of the Evaluation

15. The roles and responsibilities of the members of the Core Learning Partnership comprise:
1. Participate in the identification of key issues and questions for the evaluation
 2. Review and comment upon the Approach Paper, including the proposed evaluation process
 3. Provide views on programme implementation of the programme and on its impact
 4. Serve as a resource person who provides information related to those aspects of programme implementation for which he is directly implicated
 5. Review draft version of the evaluation report
 6. Participate in the discussions with partners on evaluation findings and recommendations
 7. Participate in the drafting and approval of the Agreement at Completion Point

1. The evaluation team was to look into a number of key questions that have been identified by Core Learning Partners to the evaluation. These were:

- What strategies has the programme used to target poorer members of communities? And how effective have they been in reaching those people?
- To what extent have increases in yields from newly adopted varieties resulted in increased incomes or increased food security for poor households?
- How successful has the programme been in choosing research topics, choosing researchers, ensuring farmer participation in research and linking research to extension?
- What agro-ecological zones have benefited most from the programme?

A. Targeting

2. RTIP aimed at providing benefits to about 720 000 resource-poor farmers with highly insecure access to basic food requirements. Amongst those beneficiaries it was to give priority to women. The targeting approach aimed to be non-confrontational and not compromising local solidarity systems. The PAR proposed to distribute the planting material within the community according to its own traditional exchange systems in quantities sufficient to initially plant 0.1 acres. This limitation was seen as an important self-targeting criterion since such small amounts would not be attractive to larger farmers. The community at large would be kept fully informed of the programme's intended target group of economically weaker elements and women. Local chiefs, supported by public services, would be entrusted with responsibility for ensuring that the resource-poor families benefit directly from the programme. With the assistance of the AEAs, tertiary multipliers would distribute the planting materials to smallholders essentially classified as the poorest of the poor, who have limited capacity to obtain materials at market prices. The rules and procedures for the multiplication and distribution of the planting material, including the use of the tubers, would be determined by each group. Aspects left out in the design were related to qualitative aspects of targeting, e.g. type of products and preferences, research topics and needs of different socio-economic categories. The RTIP project launching workshop held in August 1998 further specified the target group as a small-holder cultivating up to 1.2 ha or a person normally not having access to land.

3. The proposed targeting approach focuses on the distribution of planting material. No guidance was provided for adaptive research, IPM and CSM components in terms of how best to address the needs and constraints of the resource-poor farmers and women. In RTIP's approach the tertiary multiplier is the single most important stakeholder in reaching the larger community of resource-poor farmers and women.

4. The concentration of RTIP on cassava, a crop usually grown for both home consumption and marketing as a fresh or as a processed product by small-scale farmers, holds the potential for reaching many resource-poor farmers under the current circumstances. Furthermore, the project distribution of planting material to tertiary multipliers in amounts sufficient to cover only limited surfaces benefited small farmers proportionately more than those with larger areas. Distribution of improved planting material by extension services to some medium- and large-scale growers, primarily producer-processors, did not detract significantly from benefits to poorer farmers.

5. The definition of the target group is difficult to interpret in the sense that in areas with lower rainfall and with more irregular rainfall patterns, the area required to sustain a household needs to be larger than 1.2 ha, and because landless people cannot be the only target group of a national project aiming at improving farming productivity. If RTIP had intended solely to maximise the support to the poorest and the landless people, programme might well have been given to processing and marketing

of roots and tubers, that is off-farm income-generating activities, and not to cultivation. As production was important and improved production practices were available to benefit farmers, the involvement of some larger farmers was necessary. In particular, it was necessary to do secondary cassava multiplication with farmers who had larger areas under cultivation.

6. The programme pursued the targeting strategy as proposed in the design. No provisions were made for specific approaches by group formation officers and AEAs to ensure that the farmers that they were working with were poor. Since the distribution process and channels of planting material at tertiary level have not been fully monitored, the number of end-receivers of improved planting material cannot be accurately determined. Nor is it clear what their relative status is with respect to poverty. Whereas, there are some indications that most secondary multipliers were medium-scale and better-off farmers.⁴¹

7. Several Implementation Support Mission Reports stated that targeting women has been difficult. The great majority of the secondary and tertiary planting material multipliers were men. Cases were encountered where cultural norms and values tended to exclude women from the participation in the programme, because men and women do not work together (as in the Greater-Accra and Ashanti Regions) and because women do not have control over land (as in the Northern Region). While supervisory missions proposed to identify and use more appropriate delivery paths to effectively reach women in such environments, it has been difficult to achieve this through the extension service. Where collaboration with NGOs and religious bodies was intensified, slightly improved results appear to have been achieved.

8. Tertiary multipliers met by the mission reported that improved planting material was mainly distributed to men and women farmers in the community, free of charge, and after securing one's own requirements for the next planting season. According to tertiary multipliers, improved planting material is nowadays available in sufficient quantity and anybody who is interested in receiving it has been supplied. Neither RTIP nor secondary or tertiary multipliers defined any criteria for the identification of end receivers of improved planting material. While the AEAs had been encouraged to underline a responsibility of tertiary farmers to supply improved planting material to poor farmers, there are no records to confirm this. But, neither is there evidence that anyone has been excluded or denied access to improved material.

9. In more than one instance, it emerged that the "poorest of the poor" tend not to be members of the tertiary multiplier groups, due to their lack of resources.⁴² Proposals made by an ISM in 2002 to modify targeting have apparently not been implemented by PCO.

10. RTIP did not follow an explicit targeting strategy related to the choice of research topics and varietal selection. No locality-specific needs assessment has been carried out to ensure that the particular needs of specific socio-economic categories were addressed by the programme. Yield considerations were given priority over considerations of the consumption patterns and income flows of the target group. In the early drive to get out the first improved varieties and in initial research work target group concerns, such as taste preference, suitability for processing and storage, harvesting periods, socio-cultural compatibility, etc., were not adequately taken into consideration.

⁴¹ The BAS found that 60% of the respondents, which were primarily secondary multipliers and FFS participants, are literate. This is higher than the national average, which is 36.90% for rural poor [Ghana Core Welfare Indicators Questionnaire Survey, 1997/8]. Under the assumption of a positive correlation between adult literacy rate and socio-economic status, these farmers were not resource-poor. It appears that the selection of secondary multipliers was biased towards literate people, opinion leaders and farmers willing to experiment with new techniques. While this selection was certainly justified in technical terms, it does on the other hand not automatically imply that the majority of RTIP beneficiaries do not belong to the lowest socio-economic category of the rural population, the ultra-poor.

⁴² This refers to a tendency of very poor farmers not to seek admission to such groups, as well as a tendency of groups not to admit very poor farmers as this might affect homogeneity and efficiency.

11. Further, the programme missed the opportunity to reach the poor by providing information and advisory services to the poor producers and processors. The design and implementation of the information, communication and education campaigns were inadequate in this regard. In order to make choices and minimise risks, resource-poor households would have required more information on prices and markets, on the characteristics of different roots and tuber varieties, on their comparative advantages, on their potential uses, on alternative processing technologies, and on the costs and benefits of those technologies, among others.

B. Food security and Income Increases

12. Starting with cassava, there is no doubt that the new varieties propagated by RTIP have higher yields than existing local ones. In the case of sweet potatoes, available sources also show that new varieties have much higher yields⁴³. Following the RTIP study on cassava yields, average yields of the three varieties propagated by RTIP were 106% higher in 2001 than the average yields of existing varieties. A look at the different yields of improved and local varieties in 2001 reveals that these yield increases are in the range of 55% to 125% in the five major agro-ecological zones. However, these results were obtained on farms of secondary multipliers, whose total production expenses had been paid for by RTIP, and with an almost total compliance with agronomic best practices. Moreover, secondary multipliers represent the most experienced farmers with above average resource endowment. Their outcomes represent near-optimum results. A prudent informed estimate of the yield increases that could be obtained by ordinary farmers, in particular the targeted poor farmers with less resources to weed frequently, would be 40-60% when some of the recommended agronomic practices are applied, and around 30% only if only new varieties are planted.

13. However, equating yield increases with income increases is not justified. First, the BAS revealed that farmers selling improved cassava varieties could in many cases do so only with a discount of up to 30% compared to ordinary varieties⁴⁴. Second, production costs of improved varieties are higher than of local varieties if the full yield potential is to be realised. Third, using the year 2001 as reference year, prices for fresh cassava had declined in mid 2003 by 23% in nominal terms and by 45% in real terms; a substantial production increase of 20% from 2000 to 2002 may have been one of the causes for this price decline. In the absence of baseline studies, a repetition of surveys covering these farmers, and of reliable data on income, the evaluation team estimates that secondary multipliers may have realised real income increases of up to 20-30% from cassava, whereas in the case of ordinary farmers, these increases may not exceed 10%.

14. Still, about 55%, or just over half of the predominantly secondary multipliers and farmers attending a FFS who were interviewed in the BAS, stated that their incomes had increased since the inception of the RTIP. A substantial part of the secondary multipliers and participants of FFSs (44% of all respondents) mentioned that due to the income increases realised, they had increased household assets, such as farm holdings, bicycles, clothes, buildings, radios, clocks, sewing machines, bags, etc., and some mentioned that the increase in income during RTIP has helped them to better finance the education of their children. In the case of sweet potatoes, farmers in Northern Ghana uniformly confirmed that their income had risen due to the combined effects of increased production output and increased local prices. These price increases were mainly due to a high demand for sweet potatoes from the neighbouring Burkina Faso, to where substantial quantities were exported. These groups constitute about 14 500 beneficiaries overall. However, that is only some 14% of the farmers reached by RTIP to date or about 2% of the total number of beneficiaries intended RTIP target.

⁴³ Yield studies on secondary multipliers in the Upper-East region showed average yields of 11 t/ha for the Sauti and 13-15 t/ha for the Faara variety respectively. The actual yield potential may actually be higher as on-station yields for improved varieties were in the range of 29-35 t/ha.

⁴⁴ BAS, Chapter 3.3 Income (Draft version, September 2003).

C. Research and Farmer Participation

15. The adaptive research component (ARC) of RTIP seeks to conduct research to develop a pipeline of new technologies that can be made available to farmers. At a review meeting on the adaptive research component held at KNUST in March 2000, a set of new research proposals were selected. These were essentially selected by the researchers themselves organised into a series of working groups for each of the major themes in the component. Although there was some external (from IITA) membership of some of the workgroups, essentially the researchers were choosing between their own proposals. Progress of the research was reviewed at two subsequent workshops at CRI and at the Soil Research Institute in November 2002. At this last meeting, progress was reviewed by four “external” reviewers.

16. The research programme proposed and implemented was broad and has covered the majority of issues relevant to root and tuber crops development. The attempt to cover a wide range of topics in the main focus areas meant that there were a large number of small projects. It may have been more effective to fund a smaller number of larger better co-ordinated and resourced projects. A system with Zonal Research Co-ordinators was put in place to co-ordinate research in each of four zones, but still the programme could be criticised for lacking co-ordination in some on-farm studies, for example in the farming systems and soil fertility work.

17. Whilst the overall programme was broad, farmer perspectives and the needs of the poor were not sufficiently taken into consideration in the selection of research topics. The emphasis given to the main research areas is questionable in two respects, with a serious under-representation of post-production and socio-economic research. This has limited the overall potential impact of the research programme. The lack of emphasis on post-production issues meant that research into interventions of an appropriate scale has not been undertaken. This weakness has been not only in specific socio-economic research projects, but also in socio-economic inputs to on-farm technology development and testing. This is a major omission and has meant that financial benefits of many of the technologies have not been reported.

18. Despite the limitations mentioned above, the selection of the many of the major topics has been appropriate (e.g. in breeding, soil fertility management, control of major pests and diseases). Funding for specific projects has come through selection of proposals submitted by researchers, with reviews of these were largely done by the researchers themselves. Selection of researchers was facilitated by zonal research co-ordinators. Most such co-ordinators were breeders and agronomists which probably influenced the kind of work carried out. In retrospect, the process could have benefited from external independent assessments that in some cases could have really raised the quality of the research carried out.

19. Researchers were selected through the selection of their submitted proposals – this in principle seems fair. Initially, the range of collaborators was limited to mainly CSIR institutions, but was broadened to allow the involvement of a wider range of institutions, such as the universities. This created a two-tiered system that disadvantaged those that came in later, which should be avoided if there is another phase of RTIP. In Ghana, there are for any specific area of research only a limited number of organisations and researchers who can carry out research work. Certain work will have to be done in some specific locations. This means that the selection process cannot be entirely based on submission of the best proposal – but review processes need to be in place to ensure that the optimal outputs are obtained for any specific investment.

20. On farm research has ensured that good linkages are made with between researchers and a relatively small number of farmers. Farmer fields were used and allowed direct observation by farmers of the outcome of research, therefore, facilitating adoption of results. For example, on-farm evaluation of organic manure on sweet potato production in the Upper East Region resulted in increases in the

yield of the crop. Such studies improve the awareness of farmers on the need to properly manage sweet potato with organic manure. The involvement of Technical Officers and AEAs in such studies has strengthened the research extension linkage. There have been positive examples of where field observations from RTIP have fed back into research activities and, in the opposite direction, research results have been rapidly demonstrated in hotspot areas, for example in the case of cassava tuber rot.

21. The challenge is to scale-up research outputs to have wider impact. Many of the research outputs are at a demonstration stage and there needs to be an emphasis on production of dissemination materials – this has so far not been given high priority. The main emphasis of RTIP as an extension programme is that has focused on the distribution of improved planting material. Research activities have largely been undertaken in parallel with the extension activities, although there are some examples of integration, this could have been stronger. Integration at the Programme Management level may well have improved the overall research extension linkage.

D. Regional Distribution

22. At present, RTIP covers more than half of all administrative districts and all six agro-ecological zones in a relatively representative and equitable manner. However, the focus on cassava has dominated the project and so work has been concentrated in cassava growing areas to the benefit of cassava farmers. Sweet potatoes grown mostly in the Upper East, Northern and Upper West Regions have received little attention. Farmers in the humid forest areas who grow cocoyams and the yam growers of the northern savannah have received no benefits from RTIP as yet.

IMPLEMENTATION RESULTS**APPENDIX III**

Objectives	Outputs	Indicators	Status 31.5.2003
General Objective	Enhance the food security and improve the income of resource-poor farmers by facilitating access to new but proven locally adapted technologies for root and tuber crops	<ul style="list-style-type: none"> - 720,000 resource-poor beneficiaries by PY 6 - Level of calorie consumption during lean season increased 15% in beneficiary households - Household incomes increase 15% in beneficiary households 	<ul style="list-style-type: none"> - 119,272 beneficiaries - unknown - unknown
Specific Objectives	1) Develop the planting materials multiplication system for root and tuber crops in order to increase the availability and adoption of new varieties by smallholders	<ul style="list-style-type: none"> - 700,000 smallholders adopt new cassava varieties by PY6 - 20,000 smallholders adopt new sweet potato varieties by PY 6 - Average yields of adopting farmers increase by 40% for cassava and by 30% for sweet potatoes by PY6 	<ul style="list-style-type: none"> - 104,777 smallholders adopt new cassava varieties - 14,495 farmers adopt new sweet potato varieties - Average cassava yield of adopting farmers increased by 106%; unknown for sweet potatoes
	2) Develop the Integrated Pest Management System to reduce field and post harvest losses and increase smallholder root and tuber crop productivity.	<ul style="list-style-type: none"> - Production losses of root and tuber crops due to pests and diseases reduced by at least 20% by PY 6 - Average storage loss of cassava and sweet potato due to borers and weevils reduced progressively by 50% by PY 6 	<ul style="list-style-type: none"> - Production estimates not yet done, but 59.5% reduction on field level infestations - Unknown
	3) Strengthen the adaptive research system for root and tuber crops in order to increase the flow of new technologies available to farmers, including women: collect, evaluate and conserve root and tuber germplasm in order to help in conserving the rich plant biodiversity of Ghana	<ul style="list-style-type: none"> - Research Staff working on root and tubers increased by at least 5 by PY 2 - At least 15 new varieties released (3 each for cassava, sweet potato, sanitized sweet potato, cocoyam and fra-fra potatoes) and 5 other new technologies (soil fertility management, cocoyam and fra-fra agronomy, yam minisett and husbandry, sweet potato storage etc.) on-farm tested and found adoptable by smallholders by PY 6 - No. of germplasm accessions doubled and range of root and tuber crops in germplasm collection increased to 100% by PY6 	<ul style="list-style-type: none"> - 9 scientists recruited; 5 students post graduate students completed studies on root and tubers with RTIP fellowship - 3 new cassava varieties released in 2002, 1 new sweet potato variety released in May 2003; plans for releases of new varieties comprise 4 for cassava and 4 for yam, both in 2004; 5 new sweet potato varieties are in advanced stage; preparations for cocoyam releases are undertaken - Root and tuber accessions in national collection: fra-fra potato - 100%; Colocasia - 100%; Yam – 80%; and cassava 40%. Collection suspended to focus on characterization.
	4) Empower resource-poor farmers, farmer groups and rural communities including women to ensure unimpeded access to improved root and tuber technologies	<ul style="list-style-type: none"> - 24,000 farmer groups (at least 30% women) trained and participating in root and tuber extension activities by PY 6 	<ul style="list-style-type: none"> - 10,416 groups formed (39% women), of which 7,477 are participating in root and tuber extension

Project Effectiveness Matrix

[illegible]

	Key Questions for Impact Assessment in Rural Communities Affected by the project (changes to which the project has contributed)	Assessment of Change (1)				Reach of Change (3)				Dynamic Processes ** (4)	Sus. Pot. *** (5)
		Presence and Direction of change (+) (0) (-)	What has changed (Indicators)	Extent of Change:		How Many (households and people)	Who (1) (Poor/ poorest/b etter off)	Who (2) M/F	Project contri- bution 4/3/2/1	4/3/2/1	4/3/2/1
				How much	(Rating)* 4/3/2/1						
IV. Food Security (Production, Income and Consumption)	4.1 Did children nutritional status change?	0									
	4.2 Did household food security change?	+	Production output		3	80,000	All	m/f	4		4
	4.3 Did farming technology and practices change?	+	New farming techniques, yield	applicatio n	3	80,000	Poor	m/f	4		4
	4.4 Did the frequency of food shortage change?	Less food shortage	No. of meals in lean season		3	80,000	All	m/f	4		4
	4.5 Did agricultural production change (area, yield, production mix, etc.)?	+	New technology	applicatio n	3	75,000	Poor		4		4
V. Envt & common resources	5.1 Did the natural resource base status change (land, water, forest, pasture, fish stocks...)?	-	Soil nutrition		2	100,000	All	m/f	3	2	n.a
	5.2 Did exposure to environmental risks change?	+	Cyanide content		2	100,000	All	m/f	3	2	n.a.
VI. Institutions, policies, and regulatory framework	6.1 Did rural financial institutions change?	n.a.									
	6.2 Did local public institutions and service provision change?	+	Annual contacts	frequency	2			m/f	3	3	2
	6.3 Did national/sectoral policies affecting the rural poor change?	n.a.									
	6.4 Did the regulatory framework affecting the rural poor change?	n.a.									

Rating: 4= High; 3= Substantial; 2= Modest; 1= Negligible. The rating here is based on the rural poor (and their partners) perspective in relation to the situation in the base year. *** Rating: 4= Highly likely, = Likely; 2= Unlikely; 1= Highly Unlikely. ** This refers to cases where even though impact achievement is modest or negligible, the project in question has set in motion dynamic positive processes that will eventually lead to substantial impact achievement. The identification of the existence of these processes is left to the evaluators' judgment on a case by case basis.

ii) Project Effectiveness Matrix

MAIN DOMAINS OF IMPACT	Key Questions for Impact Assessment in Rural Communities Affected by the project (changes to which the project has contributed)	Expectation of Impact (Project Stated Objectives)				Effectiveness Rating (Achievement Against Stated Objectives) 4/3/2/1			
		Reach Who?	Change What?	Change How Much?	Reach how Many?	Reach Who?	Change What?	Change How Much?	Reach how Many?
I. Physical and financial assets	1.1 Did farm households physical assets change (i.e. farmland, water, livestock, trees, equipment, etc.)?	n.a.							
	1.2 Did other household assets change (houses, bicycles, radios other durables, etc.)	n.a.							
	1.3 Did infrastructure and people access to markets change? (transport, roads, storage, communication facilities, etc.)	n.a.							
	1.4 Did households' financial assets change? (savings etc)	RPFW	Income	+ 15%	720 000	2	2	2	1
	1.5 Did rural people access to financial services change? (credit, saving, insurance, etc.)	n.a.							
II. Human Assets	2.1 Did people access to potable water change?	n.a.							
	2.2 Did access to basic health and disease prevention services change?	n.a.							
	2.3 Did the incidence of HIV infection change?	n.a.							
	2.4 Did maternal mortality change?	n.a.							
	2.5 Did access to primary education change?	n.a.							
	2.6 Did primary school enrolment for girls change?	n.a.							
	2.7 Did women and children workload change?	Wome n	Time in production and processing	Not specified	Not specified	1	1	0	1
	2.8 Did adult literacy rate and/or access to information and knowledge change?	RPFW	Cultivation and processing techniques	Not specified	24000 farmer groups	3	3		2

	Key Questions for Impact Assessment in Rural Communities Affected by the project (changes to which the project has contributed)	Expectation of Impact (Project Stated Objectives)				Effectiveness Rating (Achievement Against Stated Objectives) 4/3/2/1			
		Reach Who?	Change What?	Change How Much?	Reach how Many?	Reach Who?	Change What?	Change How Much?	Reach how Many?
III Social capital and people empowerment	3.1 Did rural people organisations and institutions change?	RPFW	Production processing groups	Not specified	68'000 groups of F+M	3	2	2	2
	3.2 Did social cohesion and local self-help capacity of rural communities change?	RPFW			720'000	1	2		
	3.3 Did gender equity and/or women' conditions change?	RPFW	farming practices, nutrition, income	Not specified	18'600 women groups	3	2	2	2
	3.4 Did rural people feel empowered vis-à-vis local and national public authorities and development partners? (Do they play more effective role in decision making?)	n.a.							
	3.5 Did rural producers feel empowered vis-à-vis the market place? Are they in better control of input supply and marketing of their products?	RPFW	Processing with value adding	Not specified	Not specified	3	2	2	2
IV. Food Security (Production, Income and Consumption	4.1 Did children nutritional status change	RPFW	Sweet potato consumption		720'000				
	4.2 Did household food security change?	RPFW	Calorie consumption	+15%	720,000	3	3	3	2
	4.3 Did farming technology and practices change?	RPFW	Applied techniques	Not specified	24,000 groups	3	3	3	2
	4.4 Did the frequency of food shortage change?	RPFW	Not specified	Not specified	720,000	3	3	3	2
	4.5 Did agricultural production change (area, yield, production mix, etc.)?	RPFW	Yield	Not specified	720,000	3	3	3	3
V. Env't and common resources	5.1 Did the natural resource base status change (land, water, forest, pasture, fish stocks...)?	n.a.							
	5.2 Did exposure to environmental risks change?	n.a.							
VI. Institutions, policies, and regulatory framework	6.1 Did rural financial institutions change?	n.a.							
	6.2 Did local public institutions and service provision change?	Agric Extension	Delivery capacity	Not specified	80 districts	4	2		
	6.3 Did national/sectoral policies affecting the rural poor change?	n.a.							
	6.4 Did the regulatory framework affecting the rural poor change?	n.a.							

Note: RPFW = Resource-poor farmers and women / DADU: District Agricultural

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A. INTRODUCTION

1. The overall objective of RTIP is to improve the incomes and enhance the food security situation of resource-poor farmers. As indicators for the achievement of this objective it is stated in the Project Appraisal Report (PAR) that for a total number of 720 000 resource-poor beneficiary households (i) the household incomes increased 15 percent, and (ii) the level of calorie consumption during lean season increased 20 percent. It is not possible to draw final conclusions regarding the extent to which income and food security improvements have been realized by the beneficiaries to-date as a result of the project. This is due to the fact that no meaningful baseline data was collected with regard to the income and food security situation of resource-poor farms prior to project interventions. At the same time, the usefulness of existing studies is limited due to methodological flaws and inconsistencies. However, an attempt is made below to assess the potential impact on income and food security changes resulting from the project. This is based on surveys carried out by the project including the Beneficiary Assessment Study (BAS)⁴⁵⁴⁶ recently completed, evaluation mission observations in the field, and data on price developments for root and tuber crops since project start.

B. YIELD INCREASES

2. According to the PAR it was expected that average cassava and sweet potato yields of adopting farmers increase at least 40 percent and 30 percent respectively. The only systematic collection of data on yields of improved cassava varieties took place in the course of a survey on secondary multiplication sites carried out in 2001 and 2002⁴⁷. The survey results showed large variations in average yields among districts both for local and improved varieties. At the same time, there were large variations in yields among the various improved varieties both within and between districts. When comparing between yields of improved and local varieties, it needs to be mentioned that only the estimated yields per hectare of improved varieties were based on actual quantities harvested from sample plots, whereas for the local varieties yield estimates were obtained from MOFA/SRID. Consequently, the statements made below on yield differences between improved and local varieties may not reflect the actual situation.

3. The average yield of improved varieties in Year 2001 based on data from the 43 districts covered by the survey was 25.89 tons per hectare (tonnes/ha), compared to an average yield of 12.56 tonnes/ha estimated for local varieties. The combined averages for the years 2000 and 2001 are 22.38 tonnes/ha for improved varieties and 12.21 tonnes/ha for local varieties respectively. Overall, this represents for the year 2001 an increase of 106 percent of average yields of improved varieties over the average yield of local varieties. The average increase for the years 2000 and 2001 in aggregate amounts to 83 percent. A comparison between the improved varieties is only presented for the year 2001, showing marked differences between the overall average yields of the various improved varieties (Tek Bankye: 17.35 tonnes/ha, Afisiafi: 27.17 tonnes/ha, Abasafitaa: 32.52 tonnes/ha).

4. Based on the aggregate for the year 2000 and 2001, the highest average district yields for both improved and local varieties were obtained in Zone 5 (27.9 tonnes/ha and 16.42 tonnes/ha respectively), while the lowest yields were recorded in Zone 2 (10.89 tonnes/ha and 7.01 tonnes/ha respectively). This represents average increases of 70 percent in Zone 5 and 54 percent in Zone 2 respectively. Tables 1 and 2 below summarise the main results of the survey which also show the large variations between districts within zones. More detailed tables are presented in Appendix 1. It is admitted in the survey report that the results are not conclusive with regard to the yield increases that

⁴⁵ RTIP (2003), Report on Beneficiary Assessment (Draft version September 2003).

⁴⁶ RTIP (2002), Report on Survey on Area, Yields and Profitability of the Cultivation of Improved Cassava Varieties at Secondary Multiplication Sites established in 2000 and 2001.

⁴⁷ Because of inconsistencies in Tables 3-5 of the survey report, the average figures presented in this paper are calculated based on the district averages in Table 3, and for individual improved varieties on Table 4 of the report.

can actually be attributed to the new varieties, as other factors such as soil conditions, climate and improved agronomic practices may have also contributed to the yield increase. In particular, it needs to be taken into account that the secondary multiplication sites were often established on newly cleared land, thus soil fertility can be expected to be higher there than on land which has been cropped for many years.

Table 1. Yields of Improved and Local Cassava Varieties - Total Averages

	Total Averages¹	District Averages	
		from	To
2001 (tonnes/ha)			
Average yield all improved varieties ²	25.89	3.95	54.58
- Afisiafi	26.94	3.95	64.83
- Abasafitaa	31.47	9.63	56.58
- Tek Bankye	17.35	4.89	33.46
Average yield local varieties ³	12.56	4.45	19.00
2000/2001 (tonnes/ha)			
Average yield all improved varieties ²	22.38	2.47	42.83
Average yield local varieties ³⁾	12.21	5.01	18.64

Source: RTIP (2002), Report on Survey on Area, Yields and Profitability of the Cultivation of Improved Cassava Varieties at Secondary Multiplication Sites established in 2000 and 2001.

¹ Based on 43 districts covered by the survey.

² Because of inconsistencies in Tables 3-5 of the survey report, the average figures presented in this table are calculated based on the district averages in Table 3, and for individual improved varieties in Table 4.

³ Source: MOFA/SRID estimates.

Table 2. Yields of Improved and Local Cassava Varieties - Zonal Averages

	Improved Varieties ¹			Local Varieties ¹²		
	Zonal averages	District averages		Zonal averages	District averages	
		From	to		from	To
Average Yield 2000/2001 (tonnes/ha)	10.89	2.47	22.95	7.01	5.01	9.91
Zone 2 (North Central)	23.80	14.51	42.83	12.41	6.40	17.30
Zone 3 (Central)	22.83	14.78	31.92	10.16	6.53	15.88
Zone 4 (South West)	27.90	15.66	39.91	16.42	6.05	18.64
Zone 5 (South Central)	22.16	9.94	37.97	13.84	10.00	18.00
Zone 6 (East)						

Source: RTIP (2002), Report on Survey on Area, Yields and Profitability of the Cultivation of Improved Cassava Varieties at Secondary Multiplication Sites established in 2000 and 2001.

¹ Because of inconsistencies in Tables 3-5 of the survey report, the average figures presented in this table are calculated based on the district averages in Table 3.

² Source: MOFA/SRID estimates.

5. Unfortunately, the BAS does not provide sufficient information which would allow to make a conclusive statement about the increased yields realized by the beneficiaries. Detailed information on cassava yields was obtained from around 20 percent of farmers interviewed, however, no distinction was made between local and improved varieties. There were wide variations in yields which ranged from as low as one ton per acre (2.5 tonnes/ha) to 15 tonnes per acre (37.5 tonnes/ha) averaging 3.8 tonnes per acre (9.5 tonnes/ha). These figures have to be treated with care since farmers usually did not keep records and yield estimates were often reported in terms of various local measures which sometimes differed between regions, making conversion into kg difficult.

6. In general, however, the yield potential of the improved varieties as measured on the secondary multiplication sites can be supported by mission observations in the field. Yield increases from 5 tonnes per acre to 10-12 tonnes per acre (corresponding to an increase from 12.5 tonnes/ha to 25-30 tonnes/ha) were reported by farmers after they introduced new varieties. In one case even around 17 tonnes per acre (42.5 tonnes/ha) were realized. Realistic average yields on small-scale farms,

however, may be rather in the range from 7 to 8 tonnes per acre (17.5-20 tonnes/ha) as reported to be the typical yield of farmers who received improved planting material from the project and sold their crop to the Bawjiase starch processing factory.

7. The yield potential of the "Tek Bankye" variety seems to be well below the potential of the "Abasafitaa" and "Afisiafi" varieties. However, there is a high demand for "Tek Bankye" which may be explained by the fact that this variety can easily be pounded and locally consumed as "fufu", whereas the other varieties are only suitable for processing. This clearly shows that yield is not the only and often not the most important criterion for farmers when selecting a variety. Finally, the crucial question is to which extent the increased yields and soil fertility can be sustained when cultivating high-yielding varieties in the long-run, taking into account the higher demand of these varieties on soil nutrients.

8. While for sweet potatoes typical average yields of around 7 t/ha were reported for local varieties, yield studies on secondary multiplication farms in the Upper-East Region showed average yields of 11 t/ha for the "Sauti" and 13-15 t/ha for the "Faara" variety respectively. The actual yield potential can be assumed to be much higher as on-station yields for improved varieties reported by the project ranged from 29 to 35 t/ha.

9. In conclusion, the information available from the above mentioned surveys and mission observations in the field suggest that average yield increases of 40 percent resulting from adoption of the new varieties, as expected at the time of project appraisal, are realistic. In fact, in many cases the yield increases realized may be well above this figure, particularly if the introduction of new varieties is combined with improved agronomic practices. It is important to keep in mind that the survey results only reflect the situation of secondary multiplication farmers, who represent the most experienced farmers in the district with usually above average resource endowment. However, it is realistic to assume that resource-poor farmers may be able to achieve yield increases of 40-60 percent on average if they also apply some of the recommended agronomic practices. If only the new varieties would be planted without improving farm management, yield increases may probably not exceed 30 percent. In the case of sweet potatoes, the available sources support that yield increases resulting from new varieties are at least as high as for cassava.

C. PRODUCTION COSTS

10. The total cost of production comprise the actual expenditure (e.g. payments for land rent, hired labor, tools and planting material purchased) and the imputed cost of any other inputs for which no payment is made, but which could have been used in another way and therefore have an "opportunity cost" (e.g. family labor and capital). The BAS concludes that cost of production of improved varieties are significantly different from the cost of production of local varieties, and the survey on area, yields and profitability carried out at the secondary multiplication sites assumes that cost of production are the same for improved and local varieties. Both assumptions certainly do not reflect reality in most cases as it can be expected that the larger quantities produced result in increased labor requirements for harvesting of the improved varieties. In addition, changes in crop management may also increase the demand on labor.

11. Labor represents the main cost item amounting to around 80 percent of total variable costs (excluding interest on capital) as shown in both the paper on crop budgets of roots and tuber crop systems⁴⁸ and the survey on secondary multiplication sites. However, in case of family labor inputs, it may often not be perceived as actual cost as no payment is involved, in which case the real cost of production are under-estimated. In fact, the BAS revealed that over 75 percent of farmers interviewed farmed on their own land, without specifying the share of family labor of total labor inputs. However,

⁴⁸ RTIP (2001), Crop Budgets of Root and Tuber Crop Systems, Results for Forest and Transition Zones of Southern Ghana.

around 8 percent of farmers who were able to give some details on cost of production stated that they had no expenditure on cassava production in 2002, which implies that these farmers relied exclusively on family labor. Overall, around 55 percent of farmers reported expenditures up to 500 000 cedis per acre (1.25 million cedis/ha) and a further 41 percent had expenditures between 500 000 and 1 million cedis per acre (1.25-2.5 million cedis/ha). Only around 4 percent of respondents reported expenditures exceeding 1 million cedis per acre (2.5 million cedis/ha) up to a maximum of 1.37 million cedis per acre (3.4 million cedis/ha). In the case of sweet potatoes, 7 out of the 8 respondents spent up to 500 000 cedis per acre (1.25 million cedis/ha) and one farmer spent between 500 000 and 1 million cedis per acre (1.25 million and 2.5 million cedis/ha).

12. A more detailed assessment of the cost of production has been attempted in the survey on the secondary multiplication sites. The wide range of cost of production between and within zones is summarized in Table 3 below. It is doubtful, however, whether the actual cost of production for small-scale cassava producers can be derived from this survey. It is likely that at least some of the secondary multiplication farmers have reported expenditures that correspond to the payments made by the project for labor inputs, and do not reflect the actual costs incurred. In addition, the cost estimates are based on a wage rate of 10 000 cedis per person day, whereas the current rate for farm work is around 8 000 cedis per day and the opportunity cost of family labor may actually be lower in most cases. Given the fact that labor represents the major cost item it can be assumed that the cost of production are over-estimated by at least 20-30 percent in many cases.

Table 3. Cost of Cassava Production per ha - 2001/2002 Cropping Season

	('000 Cedis / ha)		
	Zonal Average	District average	
		from	to
Zone 2 (North Central)	2 285	1 529	2 781
Zone 3 (Central)	2 823	1 999	3 660
Zone 4 (South West)	4010	2 675	5 457
Zone 5 (South Central)	2 314	1 319	3 643
Zone 6 (East)	3 413	1 501	4 615

Source: RTIP (2002), Report on Survey on Area, Yields and Profitability of the Cultivation of Improved Cassava Varieties at Secondary Multiplication Sites established in 2000 and 2001.

D. INCOME INCREASES

13. While the information available on yields of improved varieties give some useful indication about the scale of the yield increases that have been realized or can be expected, very little is known in the project as to whether the yield increases actually translated into increased income of the beneficiary households. To be able to assess the impact on farm income it is necessary to know, in addition to the costs of production discussed above, (i) to what extent farmers are able to sell the increased output, and (ii) what prices they realized.

14. The results of the survey on secondary multiplication sites are based on the assumption that farmers are able to sell all their crops, which may actually not be the case. In fact, both mission observations and the findings of the BAS revealed that many cassava farmers presently leave large quantities of their crop in the ground, either because they are not able to find a buyer or the price offered is unacceptably low. Although this may also partly apply to local varieties, the problem of marketing is primarily related to the improved varieties, as with the exception of Tek Bankye they are less suitable for pounding and preparing traditional dishes and therefore require processing, which limits their market. Based on these findings it is safe to assume that in many cases farmers are presently not able to market the total increased production, therefore not fully benefiting from to yield increases realized.

15. In the survey on secondary multiplication sites the assumption is made that, with the exception of seasonal fluctuations, farm-gate prices of cassava in a location are the same irrespective of the variety. This does not take into account that, as mentioned above, farmers often do not find a buyer at all for their improved varieties, or the prices offered may be too low for a farmer to consider selling his/her crop. The findings of the BAS suggest that unit prices of local varieties can be as much as 30 percent above those offered for improved varieties as a result of a premium paid for varieties that can be used for direct consumption, e.g. in the form of “fufu”. The survey also shows that, given the high transport costs of fresh cassava and in the absence of adequate processing facilities, around three quarters of farmers interviewed sell their cassava entirely or partly on-farm. Only one out of four farmers sells his/her cassava exclusively off-farm, in 80 percent of these cases within a distance of 8 km of the farm. Unfortunately, neither the BAS nor the survey on secondary multiplication sites provide an analysis of the general trends since project start and/or the large seasonal fluctuations regarding prices that can be observed.

16. It is certainly a shortcoming that there is no systematic data collection on root and tuber prices in the project, not even in the form of secondary data that would be available from MOFA. Monthly data on wholesale and retail prices of cassava, yam and cocoyam is compiled by MOFA at district, regional and national level, however, sweet potatoes are usually not included, even in those districts in which they represent an important crop. At the same time, there is very little information available on the prices actually realized by farmers with regard to the different existing marketing channels.

17. Diagram 1 below shows the price development of cassava based on monthly national averages of wholesale prices since 1998, both nominal and in real terms. Although the average real price in 2002 was around 8 percent above the average for 1998, there has been a sharp decline by almost 30 percent since 2001. At the same time, prices reported for the first five months of 2003 are actually below the 1998 level in real terms (see Diagram 2). Preliminary analysis of data available from surveys and MOFA suggest farm gate-prices of approximately 40 percent of the wholesale price in most cases. This can be supported by mission observations as many farmers reported farm-gate prices ranging from 220 000 to 280 000 cedis per ton of fresh cassava at present, generally stating that two years ago prices per ton were as high as 500 000 cedis. Farmers selling their crop on-farm to the Bawjiase starch processing factory received a price of 150 000 cedis per ton at the time of the evaluation mission. An indication of the wide range of farm-gate prices realized by farmers in 2001 and 2002, based on the survey on secondary multiplication sites, is given in Table 4 below.

18. The General Living Standards Survey - Report of the Fourth Round⁴⁹ (GLSS4) revealed that cassava has the most regular pattern of harvesting of all food crops, with around one third of cassava growers harvesting their crop in every month of the year. At the same time, however, mission observations and analysis of seasonal price fluctuations suggest that in general less cassava is on the market between March and May, which is during the dry season when harvesting is more tedious because of the hard soil. Although the available price data on wholesale prices do not show consistent patterns for all years, in general it can be said that cassava prices are highest during the March - May period when food is scarce and lowest between July and November when most of the other food crops such as maize, sorghum, rice, plantain and yam become available. As can be seen from Diagram 2, prices of fresh cassava during the lean season in 2001 and 2002 have been as much as 50-60 percent in real terms above prices realized during the main harvesting season of food crops.

19. With regard to sweet potato prices, it is difficult to make conclusive statements, as no official price data series is available. In one location visited by the evaluation mission, farmers reported typical prices of 30 000 cedis per maxibag (approximately 80 kg) of improved varieties and 50 000 cedis for local varieties respectively. At the same time, however, there is evidence from both BAS and mission observations that in those cases in which farmers were able to sell to traders from Burkina Faso, prices realized were actually higher for the improved varieties than for local varieties. Price

⁴⁹ Ghana Statistical Service (2000), the General Living Standards Survey – Report of the Fourth Round (GLSS 4).

increases of around 10 000 cedis per maxibag irrespective of variety within two months after the main harvesting season (September to October) were reported. The increases may even be considerably higher as it was stated in one place that that prices after three and six months may go up by as much as 100 percent and 200 percent respectively.

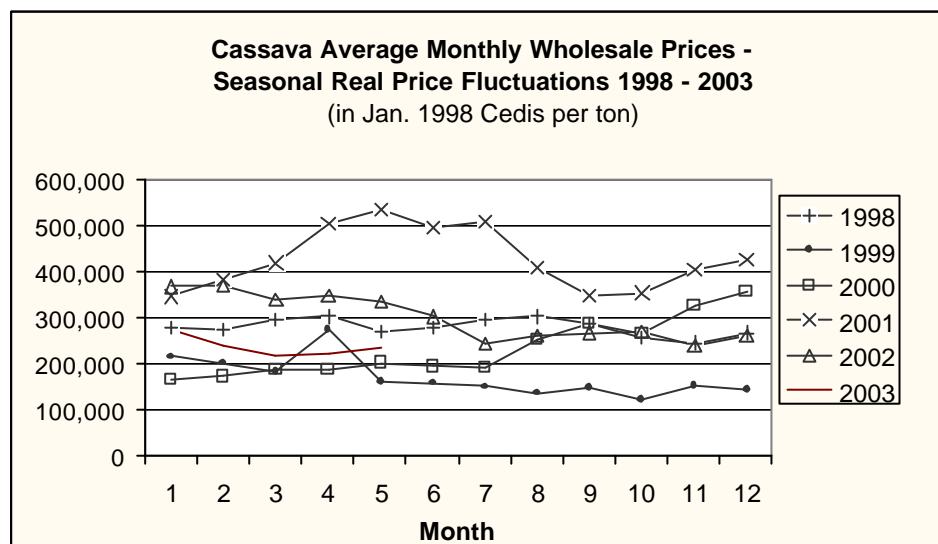
Table 4. Cassava Farm Gate Prices - 2001/2002 Cropping Season

	(Cedis / ton)		
	Zonal average ¹	District average ¹	
		from	To
Zone 2 (North Central)	330 000	101 000	873 000
Zone 3 (Central)	317 000	187 000	514 000
Zone 4 (South West)	258 000	211 000	425 000
Zone 5 (South Central)	277 000	106 000	469 000
Zone 6 (East)	253 000	76 000	415 000

Source: RTIP (2002), Report on Survey on Area, Yields and Profitability of the Cultivation of Improved Varieties at Secondary Multiplication Sites established in 2000 and 2001. Cassava

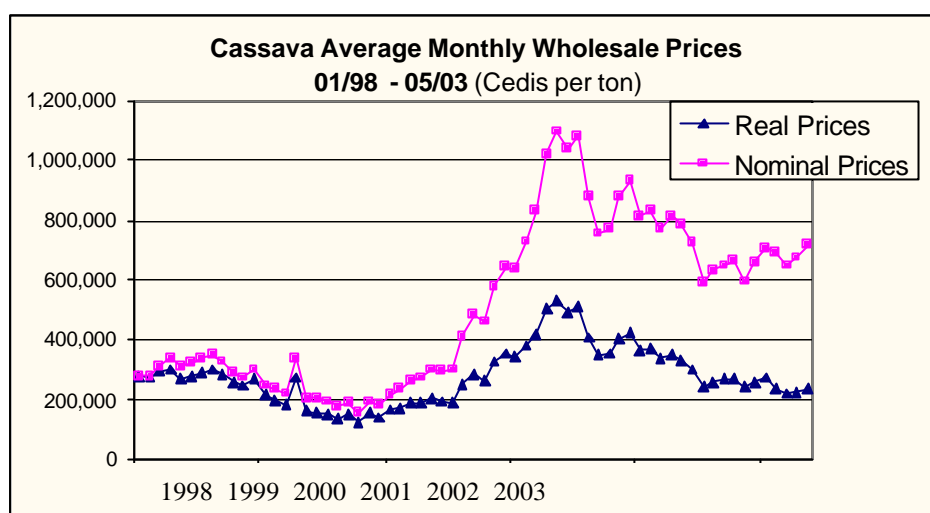
¹Prices refer to crop harvested from fields established in 2001.

Diagram 1



Source: MOFA/SRID.

Diagram 2



Source: MOFA/SRID

Note: Real prices in January 1998 cedis

Table 5. Changes of Annual Wholesale Prices for Fresh Cassava in Nominal Terms

Year of Observation	Reference Year				
	1998	1999	2000	2001	2002
1998	0%				
1999	-32%	0%			
2000	20%	76%	0%		
2001	187%	320%	139%	0%	
2002	130%	236%	91%	-20%	0%
2003¹⁾	122%	225%	85%	-23%	-3%

¹ January – May.

Source: based on MOFA/SRID national average monthly price data.

Table 6. Changes of Annual Wholesale Prices for Fresh Cassava in Real Terms

Year of Observation	Reference Year				
	1998	1999	2000	2001	2002
1998	0%				
1999	-39%	0%			
2000	-17%	36%	0%		
2001	53%	151%	84%	0%	
2002	8%	76%	29%	-30%	0%
2003¹⁾	-15%	39%	2%	-45%	-21%

¹ January – May.

Source: based on MOFA/SRID national average monthly price data.

Real prices calculated based on Statistical Service CPI.

20. The existing evidence does not allow to make a conclusive statement regarding the impact of increased yields resulting from the improved cassava varieties on income of poor households. While yield increases in the range of 40-50 percent on average are realistic, with a potential to reach 100 percent and more, quantification of changes in income actually realized by adopting farmers is more difficult. A comparison of gross and net revenues between local and improved varieties based on data from the survey on secondary multiplication sites is presented in Tables 7 and 8 below. As pointed out before, survey results are based on the assumption that cost of production and prices are the same for local and improved varieties, which is usually not true. At the same time, it can be assumed that in many cases the costs of production were over-estimated, thus the actual net revenue for both local and improved varieties may be higher. It is worth noting that that the highest average district net revenues for local varieties exceed in all zones the lowest average district net revenues for improved varieties.

Table 7. Gross Revenue of Cassava Production per ha – 2001/2002 Cropping Season

	(‘000 Cedis / ha)					
	Improved Varieties ¹			Local Varieties ²		
	Zonal average	District average		Zonal Average	District average	
		from	to		from	to
Zone 2 (North Central)	4 396	1 975	8 031	2 657	580	3 688
Zone 3 (Central)	6 531	4 076	9 336	3 094	1 512	5 358
Zone 4 (South West)	8 480	5 119	12 808	2 899	1 379	5 229
Zone 5 (South Central)	6 223	1 728	7 974	3 735	2 019	6 274
Zone 6 (East)	7 395	1 671	12 376	3 249	1 917	5 167

¹ Source: RTIP (2002), Report on Survey on Area, Yields and Profitability of the Cultivation on Improved Cassava Varieties at Secondary Multiplication Sites established in 2000 and 2001.

² Based on MOFA/SRID yield estimates and average farm gate prices.

Table 8. Net Revenue of Cassava Production per ha – 2001/2002 Cropping Season

	(’000 Cedis / ha)					
	Improved Varieties ¹⁾			Local Varieties ²⁾		
	Zonal average	District average		Zonal Average	District average	
		from	to		from	to
Zone 2	2 111	(172)	5 370	372	(949)	1 068
Zone 3	3 708	1 634	6 428	271	(986)	3 049
Zone 4	4 470	2 339	7 037	(1 112)	(2 106)	2 554
Zone 5	3 909	(1 210)	5 276	1,421	(179)	3 208
Zone 6	3 981	169	8 711	(164)	(1 459)	2 020

¹ Source: RTIP (2002), Report on Survey on Area, Yields and Profitability of the Cultivation on Improved Cassava Varieties at Secondary Multiplication Sites established in 2000 and 2001.

² Based on MOFA/SRID yield estimates and average farm gate prices, assuming cost of production as for improved varieties.

21. Although around 55 percent of the BAS respondents stated that their incomes increased since project start, it is not evident to which extent this can be attributed to project interventions. The survey assumes that increases in income from cassava result from sales of larger volumes of production, however, it has not been analyzed to which degree the increase is caused by area expansion or increased yields respectively. At the same time, it is also not clear whether the gluts observed in many local markets primarily result from the increased yields or from an expansion of area cultivated with cassava. In fact, the impact of the improved varieties on total national production may still be relatively small if compared to the production increases over the last years, which were mainly due to an increase of area cultivated with cassava (see Box 1 and Appendix 1, Tables 1 and 2). With regard to sweet potatoes, it can be assumed that most of the adopting farmers were able to benefit from both increased yields and expanding market demand from Burkina Faso, although this concerns a relatively small number as the project only reached around 5 000 farmers to-date. The crucial question is whether the increases in income can be sustained if production increases further, given that the export market potential is limited.

Box 1: How much did the introduction of improved varieties actually contribute to increased national cassava production?

Based on the assumption that (i) the project so far reached 105 000 farm household and each household is cultivating on average 1 acre of improved varieties, and (ii) average yields are 7.2 tonnes/acre (18 tonnes/ha), representing an increase of 47 percent as compared to the national average estimated for 2002 of 4.9 tonnes/acre (12.25 tonnes/ha), the increased production resulting from the project would amount to around 242 000 tonnes. This figure may be on the high-side, as it can be assumed that most farmers continue to cultivate local varieties on parts of their land, which would reduce the average yield per acre. In comparison, the estimated total increase of national cassava production during the period 1999-2002 amounts to 1.89 million tonnes, representing an average annual increase of around 630 000 tonnes (see Appendix 1, Table 1). The official production figures should be treated with care as they only represent estimates of the biological yields, and therefore do not reflect the production actually harvested. However, the simplified calculation clearly shows that, to-date, the impact of the project on total national cassava production may still be relatively small.

E. IMPACT ON FOOD SECURITY

22. Cassava clearly has a comparative advantage from the point of view of food security as it can be grown on less fertile soil, is drought resistant and can be left in the ground for long periods, thus allowing a household to harvest when food is needed. Cassava yields 2-3 times more energy per area

unit than cereal and leguminous food crops⁵⁰ and is usually referred to as “insurance crop”, providing food in cases in which other crops fail due to diseases or draught. At the same time, however, once cassava is harvested, it requires processing or consumption within a few days, otherwise it will deteriorate rapidly.

23. Official MOFA production and consumption estimates at the time of project preparation suggested a considerable annual surplus production of cassava of about 2 million tons⁵¹, which may make the rationale for focusing on increasing cassava yields as a means to achieve household food security appear questionable. Based on existing MOFA estimates⁵² annual per capita consumption only increased insignificantly between 1995 and 2000 from 149.7 to 151.4 kg despite the fact that total production increased by almost 23 percent during the same period. It should be noted, however, that the consumption figures are not based on household consumption surveys, while the production figures only represent estimates of the biological yield and therefore do not reflect the quantities actually harvested. According to the FAO Food Balance Sheet for Ghana⁵³, per capita consumption of cassava amounted to 217 kg in 2001, representing around 24 percent of total per capita calorie intake. Overall, starchy roots contribute to around 43 percent of total average per capita calorie intake in Ghana (yam and other roots and tubers contributing a further 12 percent and 6 percent respectively). It is important to note that from a nutritional point of view, there is a certain limit of the share of cassava in the diet, as cassava can be considered as nutritionally poor food, fresh tubers containing less than 1 percent of protein and very low levels of some essential amino acids.

24. Food security can basically be achieved either by (i) increasing farm incomes thus allowing households to purchase food in sufficient quantities whenever needed, or by (ii) enhancing availability of farm-produced food crops during the usual hunger periods which can be achieved by extending the storage life of the produce.

25. As has been discussed before, it is not yet possible to make a conclusive statement regarding the impact of increased yields on household income. While in many cases food security may have improved due to increased household income, the situation with regard to availability of farm-produced cassava resulting from the improved varieties is less clear-cut. On the one hand, the improved cassava varieties with maturation periods of less than one year have the advantage that they yield faster returns, and may allow to harvest and sell the crop at a time when other food crops are not yet in the market, consequently fetching higher prices. On the other hand, the improved varieties can be stored only for a relatively short period in the ground without deteriorating or rotting. This means that they are less suitable as a food-security crop which could be harvested at any time when supply from other crops is scarce. In that regard it is also important to note that some of the improved varieties (Afisiafi and to a lesser degree Abasafitaa) are not suitable for direct local consumption as they require processing, which is limiting their value as food crop. In addition, the limited storability in the field reduces the flexibility in terms of being able to spread the sales throughout the year in order to avoid possible gluts in the market. In fact, the flooding of local markets at certain times that can be observed may be primarily due to a relatively uniform harvesting pattern resulting from the above-described characteristics of the improved varieties, and to a lesser degree due to an increase in total production.

26. The BAS notes that almost four out of five farmers interviewed stated that the food situation has improved since the year 2000. However, only around 18 percent attributed the improvement to the introduction of improved varieties and/or adoption of improved cultivation practices, whereas about 60 percent linked the improvement to good harvest in general or increased production due to good

⁵⁰ Assuming average yields for cassava and maize of 12 tonnes/ha and 1.5 tonnes/ha respectively, the energy provided by cassava amounts to around 16 Mcal/ha, whereas maize only yields 6 Mcal/ha. At the same time, however, the energy content of cassava per weight unit is only about one third of the energy content of maize (around 1.3 Mcal/tonnes as compared to 4 Mcal/tonnes for maize).

⁵¹ FAO (1997), Ghana Roots and Tuber Improvement Project, Formulation Report.

⁵² MOFA (2002), Agriculture in Ghana, Facts and Figures.

⁵³ FAO (2002), Food Balance Sheet Ghana 2001.

rains. All interviewed households take at least two meals a day, and almost 80 percent take three meals a day. Although the survey does not indicate whether the farmers interviewed actually face a hunger period at times of the year, about 90 percent of respondents stated that the main hunger period in their community is usually between March and July. The survey underlines the important role of cassava as a food security crop as hunger was defined by some farmers as an over-dependence on cassava products by households.

27. It should be mentioned that increased cassava production may actually have a negative impact on the food situation of a household in *qualitative* terms in those cases in which cassava replaces food crops that are nutritionally more valuable (as it was reported in the BAS, a number of farmers reduced the area cultivated with maize, vegetables or other crops as a result of expanding cassava cultivation).

28. The introduction of cassava varieties that are more suitable for commercial production than for subsistence production may have contributed to improved household food security in those cases in which it resulted in increased household income. At the same time, the reduced storability in the ground and limited use for local consumption of some of the improved varieties may have negatively affected the household food situation if it resulted in large quantities rotting in the ground because farmers cannot find a market outlet. Based on the available data on cassava production and consumption as well as findings from the evaluation mission and the BAS, it can be argued that from the point of view of household food security the focus on high-yielding varieties may be justified but is by no means sufficient.

29. In the case of sweet potatoes, it can be assumed that the impact of improved varieties on the food security situation of the adopting households has been positive so far, due to both the existing market opportunities resulting in increased incomes and the higher nutritional value of sweet potatoes.

F. CONCLUSIONS

30. In conclusion, it can be assumed that the adoption of improved varieties in many cases led to increased household incomes, despite a considerable decline in real prices over the last two years. In the absence of comprehensive quantitative surveys or ongoing record keeping on model farms, however, it is not possible to quantify either the magnitude of the increases or the number of farmers actually benefiting from them. At the same time, there is ample evidence that in many cases farmers cultivating improved cassava varieties are not yet realizing any benefits, due to difficulties in marketing their crop. This clearly shows the importance of a demand-driven holistic approach to addressing the marketing constraints, which would not only target producers, but also traders and processors in order to diversify production and end-uses of cassava and consequently expand markets.

31. Although it can be expected that further increases in total production will lead to a further decline of producer prices, it also has the positive effect of bringing down consumer prices. It can be assumed that particularly the rural poor would benefit from this development as they consume proportionally more cassava than the better-off rural and urban population. At the same time, it can be assumed that in most cases the introduction of high-yielding varieties resulted in enhanced productivity by reducing cost of production per unit of output. This has a positive effect on those farmers who are also processors of cassava and on the local cassava processing industry, as it results in reduced prices of raw material and consequently reduced cost of production. At the same time, a reduction in the cost of cassava is a precondition if Ghana is to be competitive in export markets of cassava-based products.

32. With regard to food security, it is obvious that the yield increases realized and the overall increase of cassava production in Ghana resulted in a substantial improvement of the food security situation at the national level. In addition, the declining prices for cassava also contributed to increased household food security among non-farming households in urban and rural areas as these households could afford to buy more cassava. The food security situation of cassava growers

improved to the extent to which increased household incomes were realized. At the same time, however, due to the above-mentioned characteristics of some of the improved varieties, the availability of farm-produced food may have even decreased in many cases. This clearly shows that, in order to bring about improvements in household food security through increased availability of food for home consumption it would have been more appropriate to select varieties with regard to suitability for local consumption, nutritional value, and storability both in the ground and after harvesting. If the potential of the existing high-yielding varieties to improve household food security through increasing household income is to be fully exploited, it will be crucial to identify opportunities for expanding the market for cassava.

TABLES

Table 1: Cassava - Area Planted and Production 1995 - 2002

	Year							
	1995	1996	1997	1998	1999	2000	2001	2002
Total Area ('000 ha)	552	591	589	630	640	660	726	794
Annual Growth Rate (%)		7.1%	-0.3%	7.0%	1.6%	3.1%	10.0%	9.4%
Total Growth Rate 1995 - 2002 (%)								43.8%
Avg. Annual Growth Rate 1995 - 2002 (%)								6.3%
Total Production ('000 MT)	6 611	7 111	7 000	7 172	7 845	8 107	8 966	9 731
Annual Growth Rate (%)		7.6%	-1.6%	2.5%	9.4%	3.3%	10.6%	8.5%
Total Growth Rate 1995 - 2002 (%)								47.2%
Avg. Annual Growth Rate 1995 - 2002 (%)								6.7%
Average Yield (MT/ha)	12.00	12.03	11.88	11.38	12.26	12.28	12.34	12.25
Average Yield 1995 - 2002 (MT/ha)								12.05
Annual Growth Rate (%)		0.2%	-1.2%	-4.2%	7.7%	0.2%	0.5%	-0.7%
Total Growth Rate 1995 - 2002 (%)								2.1%
Avg. Annual Growth Rate 1995 - 2002 (%)								0.3%

Source: MOFA/SRID

Table 2: Yam - Area Planted and Production 1995 - 2002

	Year							
	1995	1996	1997	1998	1999	2000	2001	2002
Total Area ('000 ha)	176	178	187	211	243	261	287	300
Annual Growth Rate (%)		1.1%	5.1%	12.8%	15.2%	7.4%	10.0%	4.5%
Total Growth Rate 1995 - 2002 (%)								70.5%
Avg. Annual Growth Rate 1995 - 2002 (%)								10.1%
Total Production ('000 MT)	2 126	2 275	2 408	2 703	3 249	3 363	3 547	3 900
Annual Growth Rate (%)		7.0%	5.8%	12.3%	20.2%	3.5%	5.5%	10.0%
Total Growth Rate 1995 - 2002 (%)								83.4%
Avg. Annual Growth Rate 1995 - 2002 (%)								11.9%
Average Yield (MT/ha)	12.08	12.78	12.88	12.81	13.39	12.88	12.34	13.00
Average Yield 1995 - 2002 (MT/ha)								12.77
Annual Growth Rate (%)		5.8%	0.8%	-0.5%	4.5%	-3.8%	-4.2%	5.3%
Total Growth Rate 1995 - 2002 (%)								7.6%
Avg. Annual Growth Rate 1995 - 2002 (%)								1.1%

Source: MOFA/SRID

Table 3: Cocoyam - Area Planted and Production 1995 - 2002

	Year							
	1995	1996	1997	1998	1999	2000	2001	2002
Total Area ('000 ha)	205	214	206	218	246	247	262	282
Annual Growth Rate (%)		4.4%	-3.7%	5.8%	12.8%	0.4%	6.1%	7.6%
Total Growth Rate 1995 - 2002 (%)								37.6%
Avg. Annual Growth Rate 1995 - 2002 (%)								5.4%
Total Production ('000 MT)	1 408	1 552	1 530	1 577	1 707	1 625	1 688	1 860
Annual Growth Rate (%)		10.2%	-1.4%	3.1%	8.2%	-4.8%	3.9%	10.2%
Total Growth Rate 1995 - 2002 (%)								32.1%
Avg. Annual Growth Rate 1995 - 2002 (%)								4.6%
Average Yield (MT/ha)	6.87	7.25	7.43	7.24	6.94	6.57	6.43	6.59
Average Yield 1995 - 2002 (MT/ha)								6.92
Annual Growth Rate (%)		5.5%	2.5%	-2.6%	-4.1%	-5.3%	-2.1%	2.5%
Total Growth Rate 1995 - 2002 (%)								-4.1%
Avg. Annual Growth Rate 1995 - 2002 (%)								-0.6%
Source: MOFA/SRID	6.87	7.25	7.43	7.23	6.94	6.58	6.44	6.60

Table 4: Cost of Production and Revenues of Cultivation of Improved Cassava Varieties

	ZONE 2	ZONE 3	ZONE 4	ZONE 5	ZONE 6	Total Average ³⁾
Revenue						
Yield ¹⁾ (t/ha)	12.80	25.99	30.30	27.90	31.49	26.09
Farm Gate Price ²⁾ ('000 cedis/ton)	343	251	280	223	235	244
Gross Revenue³⁾ ('000 cedis/ha)	4 396	6 531	8 480	6 223	7 395	6 359
Variable Costs⁴⁾ ('000 cedis/ha)						
Land rent	145	159	288	190	170	174
Land clearing	136	250	544	256	289	307
Land preparation	364	203	8	109	148	421
Planting/refilling	107	157	263	220	491	305
Weeding	689	764	1 028	604	952	806
Agro-chemicals	11	38	100	1	1	56
Harvesting/transport	133	192	360	203	241	229
Tools/equipment	112	169	354	0	0	213
Firebelt	119	87	42	0	85	157
Total Variable Costs⁵⁾	1 817	2 091	2 987	1 764	2 605	2 668
Interest on Capital ⁴⁾	468	732	1 024	550	808	670
Total Costs	2 285	2 823	4 010	2 314	3 413	3 338
Net Revenue ('000 cedis/ha)	2 111	3 708	4 470	3 909	3 982	3 021

Source: compiled from the report on Survey on Area, Yields and Profitability of the Cultivation of Improved Cassava Varieties at Secondary Multiplication Sites established in 2000 and 2001

1) 2001;

2) average calculated on the basis of average yield and gross revenue

3) based on Table 6 of the report

4) costs and interest on capital based on Appendix III of the report

5) based on zonal averages presented in the report (not in all cases equivalent to the sum of zonal averages for each item)

Table 5: Yields of Improved and Local Cassava Varieties - Total Averages

	National Averages¹⁾	District Averages				
		Min.	1st Quartile	Median	3rd Quartile	Max.
	(MT/ha)					
2001						
Average yield all improved varieties ²⁾	25.89	3.95	17.60	25.63	33.24	54.58
- Afisiafi	26.94	3.95	17.30	26.72	33.33	64.83
- Abasafitaa	31.47	9.63	25.48	28.89	38.79	56.48
- Tek Bankye	17.35	4.89	12.35	17.76	21.62	33.46
Average yield local varieties ³⁾	12.56	4.45	9.89	11.86	16.76	19.00
2000/2001						
Average yield all improved varieties ²⁾	22.38	2.47	15.63	21.13	28.02	42.83
Average yield local varieties ³⁾	12.21	5.01	9.59	11.31	15.82	18.64

Source: Report on Survey on Area, Yields and Profitability of the Cultivation of Improved Cassava Varieties at Secondary Multiplication Sites established in 2000 and 2001

1) Based on 43 districts covered by the survey.

2) Because of inconsistencies in Tables 3-5 of the survey report, the average figures presented in this table are calculated based on the district averages in Table 3, and for individual improved varieties on Table 4.

3) Source: MOFA/SRID estimates

Table 6: Yields of Improved and Local Cassava Varieties - Zonal Averages

	Improved Varieties ¹⁾					
	Zonal Averages (MT/ha)	District Averages				
		Min.	1st Quartile	Median	3rd Quartile	Max.
Average Yield 2000/2001						
Zone 2	10.89	2.47	7.78	9.87	11.40	22.95
Zone 3	23.80	14.51	19.34	20.74	27.93	42.83
Zone 4	22.83	14.78	20.92	22.29	25.67	31.92
Zone 5	27.90	15.66	20.56	25.99	34.03	39.91
Zone 6	22.16	9.94	15.12	19.29	29.98	37.97
	Local Varieties ^{1) 2)}					
	Zonal Averages (MT/ha)	District Averages				
		Min.	1st Quartile	Median	3rd Quartile	Max.
Average Yield 2000/2001						
Zone 2	7.01	5.01	6.12	6.43	7.57	9.91
Zone 3	12.41	6.40	11.00	11.55	14.31	17.30
Zone 4	10.16	6.53	8.89	9.54	11.31	15.88
Zone 5	16.42	6.05	14.34	18.12	18.52	18.64
Zone 6	13.48	10.00	11.35	12.93	14.99	18.00

Source: Report on Survey on Area, Yields and Profitability of the Cultivation of Improved Cassava Varieties at
Secondary Multiplication Sites established in 2000 and 2001

1) Because of inconsistencies in Tables 3-5 of the survey report, the average figures presented in this table
are calculated based on the district averages in Table 3.

Table 7: Estimated Number of Households Harvesting, Area and Production for Selected Crops

Crop	Households		Area		Production		
	Est. no. of hh harvesting crop in last 12 months ¹⁾	% of total farm hh	Cropped Area 1998 ²⁾ (ha)	Area/hh harvesting crop (ha)	Production 1998 ²⁾ (MT)	Average production/ ha ²⁾ (MT)	Average production/ hh harvesting crop ³⁾ (MT)
Maize	2 406 900	88%	696 621	0.29	1 015 029	1.46	0.42
Cassava	1 517 000	55%	629 683	0.42	7 171 452	11.39	4.73
Yam	945 000	34%	210 915	0.22	2 702 857	12.81	2.86
Plantain	942 000	34%	245 917	0.26	1 912 648	7.78	2.03
Cocoyam	866 000	32%	217 767	0.25	1 576 687	7.24	1.82
Groundnut/peanut	604 100	22%	176 773	0.29	193 171	1.09	0.32
Sorghum/millet/guinea corn	467 800	17%	513 096	1.10	517 688	1.01	1.11
Rice	361 400	13%	130 393	0.36	281 111	2.16	0.78

1) source: GLSS 4 (data collection between April 1998 - March 1999)

2) source: MOFA/SRID

3) calculated

Table 8: Estimated Annual Value of Harvest and Sales of Selected Crops (in March 1999 Cedis)

Crop	Estimated annual value of harvest			Estimated annual value of sales		
	Total ¹⁾	Average value/ha ²⁾	Average value/hh harvesting crop ¹⁾	Total ¹⁾	Average value/ha ²⁾	Average value/hh harvesting crop ¹⁾
	(bn cedis)	(000 cedis)	(000 cedis)	(bn cedis)	(000 cedis)	(000 cedis)
Maize	544.7	782	226	230.1	330	96
Cassava	562.8	894	371	120.6	192	79
Yam	223.0	1 057	236	51.1	242	54
Plantain	401.6	1 633	426	173.0	703	184
Cocoyam	159.4	732	184	39.0	179	45
Groundnut/peanut	146.1	826	242	60.2	341	100
Sorghum/millet/guinea corn	98.4	192	210	11.9	23	25
Rice	126.0	966	349	53.3	409	147

1) source: GLSS 4 (in March 1999 cedis)

2) calculated based on MOFA/SRID area data

Table 9: Estimated Annual Value of Harvest and Sales of Selected Crops (in May 2003 Cedis)

Crop	Estimated annual value of harvest			Estimated annual value of sales		
	Total ¹⁾	Average value/ha ²⁾	Average value/hh harvesting crop ¹⁾	Total ¹⁾	Average value/ha ²⁾	Average value/hh harvesting crop ¹⁾
	(bn cedis)	(000 cedis)	(000 cedis)	(bn cedis)	(000 cedis)	(000 cedis)
Maize	1 382.9	1 985	575	584.2	839	243
Cassava	1 428.9	2 269	942	306.2	486	202
Yam	566.2	2 684	599	129.7	615	137
Plantain	1 019.6	4 146	1 082	439.2	1 786	466
Cocoyam	404.7	1 858	467	99.0	455	114
Groundnut/peanut	370.9	2 098	614	152.8	865	253
Sorghum/millet/guinea corn	249.8	487	534	30.2	59	65
Rice	319.9	2 453	885	135.3	1 038	374

1) source: based on GLSS 4 (Table) and CPI of March 1999 and May 2003

2) calculated based on MOFA/SRID area data

Table 10: Estimated Number of Households Processing, Annual Costs and Value of Sales for Selected Products (in March 1999 Cedis)

Product	Households		Estimated Annual Costs				Estimated Annual Value of Sales		Estimated Annual Net Revenue/hh
	Est. no. of hh processing item in last 12 months	% of total farm hh	Total value of labor costs (bn cedis)	Average value of labor cost/hh (000 cedis)	Total value of other costs (bn cedis)	Average value of other cost/hh (000 cedis)	Total (bn cedis)	Average annual value of sales/hh (000 cedis)	
Maize flour	2 014 000	74%	67.1	33.3	95.8	47.57	256.1	127.16	46.3
Flour from other grains	103 000	4%	17.4	168.9	67.5	655.34	102.5	995.15	170.9
Gari	70 000	3%	7.3	104.3	2.7	38.57	34.2	488.57	345.7
Cassava flour	44 000	2%	12.8	290.9	20.8	472.73	31.2	709.09	-54.5

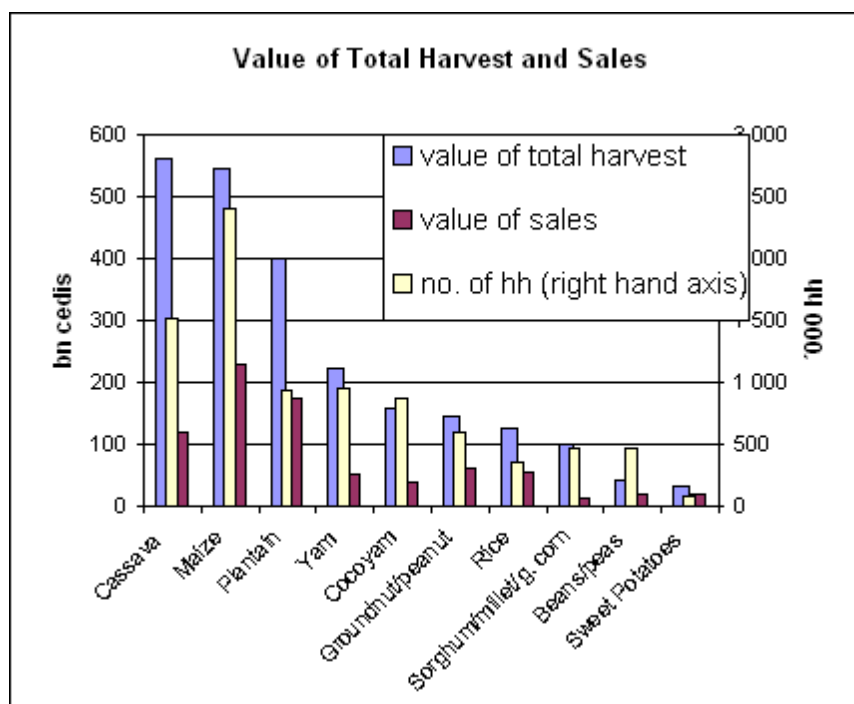
1) source: GLSS 4 (data collection between April 1998 - March 1999)

Table 11: Estimated Number of Households Processing, Annual Costs and Value of Sales for Selected Products (in May 2003 Cedis)

Product	Households		Estimated Annual Costs				Estimated Annual Value of Sales		Estimated Annual Net Revenue/hh
	Est. no. of hh processing item in last 12 months	% of total farm hh	Total value of labor costs (bn cedis)	Average value of labor cost/hh (000 cedis)	Total value of other costs (bn cedis)	Average value of other cost/hh (000 cedis)	Total (bn cedis)	Average annual value of sales/hh (000 cedis)	
Maize flour	2 014 000	74%	170.4	84.6	243.2	120.8	650.2	322.8	117.5
Flour from other grains	103 000	4%	44.2	428.9	171.4	1 663.8	260.2	2 526.5	433.8
Gari	70 000	3%	18.5	264.8	6.9	97.9	86.8	1 240.4	877.7
Cassava flour	44 000	2%	32.5	738.6	52.8	1 200.2	79.2	1 800.3	-138.5

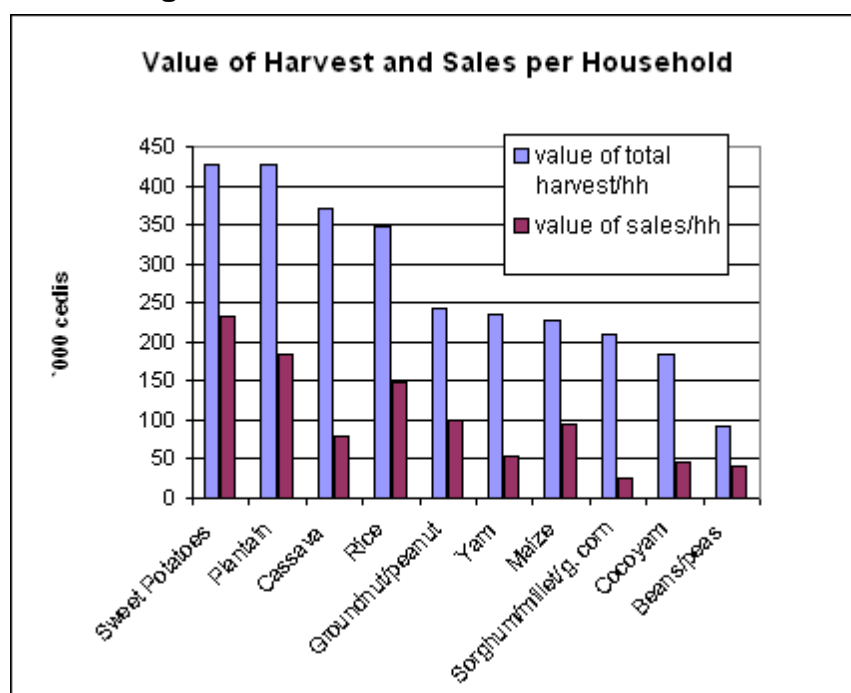
1) source: based on GLSS 4 (Table) and CPI of March 1999 and May 2003

Diagram 1



Source: GLSS 4 (data collection between April 1998 - March 1999), in March 1999 cedis

Diagram 2



Source: GLSS 4 (data collection between April 1998 - March 1999), in March 1999 cedis

