Evaluation of PFID/NP, AEG-A-00-04-00012-00
Partnerships in Food Industry Development/Natural Products
May 8, 2009

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Table of Contents

Acronyms and Abbreviations

ALO, Association Liaison Office for University Cooperation in Development
ARC, South African Agricultural Research Council
ASNAPP, Agribusiness in Sustainable Natural African Plant Products
BOTPAG, Botanical Products Association of Ghana
CFA, Colonies françaises d'Afrique (local currency)
EGAT, USAID Bureau for Economic Growth, Agriculture and Trade
GAP, Good Agricultural Practices
GACP, Good Agricultural and Collection Practices
GDA, Global Development Alliance
HED, Higher Education for Development
IDC. Indirect Costs
IITA, International Institute of Tropical Agriculture
KNUST, Kwameh Nkrumah University of Science and Technology
LAC, Latin American and the Caribbean Bureau of USAID
LWA, Leader With Associates
MQM, Making Quality Matter
MS, Master of Science (University) degree
NGO, Non-Governmental organizations
NOP, National Organic Program
NP or NPs, Natural Product(s)
NTFP, Non-Timber Forest Products
PC, Program Coordinator
PFID/NP, Partnership for Food Industry Developments in Natural Products
QA/QC, Quality Assurance and Quality Control
SPEED, Support Program for Enterprise Empowerment and Development
SME, Small and Medium Enterprises
TIPCEE, Trade Investment Program for Competitive Export Economy
USAID, United States Agency for International Development
USDA, United States Department of Agriculture
WHO, World Health Organization

Partnership for Food Industry Development/ Natural Products

Evaluation

Executive Summary

The Partnership for Food Industry Development/Natural Products (PFID/NP) supports development of several African Natural Products (Appendix 1) and builds on its close working relationship with the NGO, ***Agribusiness in Sustainable Natural African Plant Products*** (ASNAPP), to eradicate hunger, poverty and malnutrition through economic growth in Africa. Operational in six countries (Ghana, Malawi, Rwanda, Senegal, South Africa and Zambia), PFID/NP brings science-based enterprise development to small and medium scale rural producer associations and enterprises (approximately 7368 in last five years). More than 65 percent of the beneficiaries are women. Noteworthy is the money earned by rural small and medium scale enterprises (SMEs)—over $28 million in trade generated from the sale of 4600 MTs of natural products from small scale farmers. Over 50 percent of the transactions are repeat sales. Assistance to communities is designed to allow them to "graduate" from the project and operate independently while maintaining profits. Other highlights include:

- PFID/NP has benefitted, on average, 7368 farmers in Ghana, Rwanda, Senegal, Zambia and Malawi, with the large majority being women. Since 2004, PFID/NP programs have contributed to the introduction of new crops, the sustainable collection of indigenous African botanicals, and the development of new plant products that has lead to > $30 million ($US) in trade, with a production volume of 6300 metric tons. The program has benefited almost 700 agricultural related firms and producers' associations, creating more than a hundred partnerships. In total, 28,000 farmers attended short term agricultural productivity trainings with around 500 workshops and trainings provided.

- Since October 2004, the USAID office of Economic Growth and Trade has invested $2.36 million in the Rutgers University-led PFIDNP program. Rutgers University and the ASNAPP programs in Africa have leveraged an additional $4 million to strengthen this international development program.

- In the past, many herbal teas, spices and botanicals were collected or cultivated, and then sold. This practice resulted in high product variability, inconsistent quality, microbiological contamination, presence of non-plant debris, and adulterated products. PFID/NP introduced Good Agricultural Practices (GAP) and Good Agricultural and Collection Practices (GACP) specifically designed for natural products.

- Voacanga has become the leading medicinal export product of the Ghanaian PFID/NP program, generating 2,000 tons, valued at $12 million and involving 3,000 farmers and collectors.

- Also in Ghana, in 2004, Griffonia and Voacanga, the source of drugs used to suppress anxiety and for memory enhancement respectively, had no standards and

was traded *ad hoc* on the international market valued at almost $3 million annually. In 2008, with direct intervention from PFID/NP and ASNAPP/Ghana, Griffonia and Voacanga now has well established standards and trade value of $20 million.

- In Zambia PFID/NP and ASNAPP are helping local villages and private businesses access markets that are both sustainable and expanding for vegetables, flowers, herbs, spices and fruits. Zambia focus crops include paprika, birds eye chili (BEC), moringa and lemongrass with total sales, valued at $23,000 in 2004, soaring to over $$450,000 in 2008. Benefiting from Zambia's abundant land and water, ASNAPP-Zambia employed aggressive community based and lead farmer business models to transfer 23 technologies and to work directly with over 1,253 rural enterprises and 38 (predominantly women) producer associations since 2004.

- PFID/NP provides "Making Quality Matters" Workshops in Zambia and in the satellite office in Malawi and have given crop specific MQM workshops for the regional essential oils industry in East Africa (Rwanda) and southern Africa (South Africa); for the medicinal plants industry in Ghana; and participated with another USAID funded project in a national workshop in Senegal to strengthen the hibiscus industry.

- A Southern African Paprika Association was formed to help develop the paprika industry. As the result of these activities, the team has been working with 650 farmers. Since 2006 the production of paprika has reached the 300 metric tons level with a value of $400,000.

- Recognizing the success of PFID/NP and ASNAPP, the government of Senegal now supplies 35 percent of the ASNAPP annual budget. ASNAPP was asked, and did, shape a new National Hibiscus Initiative.

Recommendation: The evaluation team found that PFID/NP has been a well administered project that has made considerable progress towards its objectives and meeting the goals for which it was funded. There is considerable potential for more benefits by continuing and scaling up the activities for an additional 5 years. There are many examples of small and medium enterprises, initiated by PFID/NP, that have "graduated" and are successfully operating using the models developed under guidance from PFID/NP. A 5 year extension of the activity at an increased funding level ($900,000 per year is suggested) would allow continuation and expansion of the public/private partnerships that have been established in the first 5 years. Continuation of the LWA will also allow for Mission associate awards for country specific activities. There was Mission interest, although no commitments, if they could be convinced that the benefits could be realized on a larger scale.

Report: PFID/NP and ASNAPP are stalwarts in three primary areas: research and development, quality assurance and quality control (QA/QC) systems and market access. In addition, PFID/NP and ASNAPP partners contribute to producer associations'

organizational development, logistics, financing/credit, government rural development services, product commercialization and producer association outreach.

PFID/NP and ASNAPP's greatest asset is the dedicated and skilled staff. Rutgers University leads the research agenda in the following areas: QA/QC, product development, chemical analysis and customer feedback trials. ASNAPP (in-country) staff adapts the science to the local production situation through establishing field trials and project implementation while simultaneously leading enterprise development, setting up market linkages and production monitoring and partnership development.

PFID/NP and ASNAPP nurture strong African universities' working relationships. For example, Rutgers University collaborates with Stellenbosch University (South Africa), University of Zambia, and Kwame Nkrumah University of Science and Technology (KNUST) in Ghana, to adapt technologies to local production realities. University of Zambia manages paprika drought resistant trials and produces spores for mushroom production. KNUST holds short courses introducing natural products and how to set up natural product enterprises while also hosting moringa trials.

The gender impact of this project has been significant. Nearly all of the SMEs in the communities have begun with women and women remain the majority of the beneficiaries of the interventions.

Major findings from the evaluation team visits:

1) Business Models: Three business models dominate moving technologies to natural product SMEs. They are: (1) lead producer demonstrates how to use a technology by setting up producer/enterprise association(s), from 10 to 65 people interested in supplying new markets; (2) enterprise/producer association requests technologies to satisfy market requirements; (3) community business model—where land, equipment, technologies, profits (among others) are shared among a group of entrepreneurs for specific commodities and markets.
2) For small and medium scale enterprises, a science-based enterprise development approach results in significant household and community level social and economic impact.
3) Natural products commercialization minimizes risk inherent in staple crop monoculture production systems.
4) Natural Products commercialization raises the bar for participating SMEs in the commodity value chain. SMEs learn how to: make multi-purpose partnerships; adapt new technologies; record production and market interventions; and seek financial services. All the aforementioned helps to move subsistence farmers and informal SMEs into the formal business sector. Natural products commercialization coerces SMEs to invest modestly in, at least, one or two links along the value chain where they function, earning even greater profit margins for SMEs.
5) Cognizant of rising food prices over the last four years in Africa, ASNAPP introduced staple crops (*e.g.*, maize, sorghum, millet, potato) in commercial, natural products cultivation systems to increase purchasing power among rural households.

6) Success in intercropping of staple crops opened the door to horticulture production and marketing opportunities. Horticulture sales to hotels, supermarkets and bed and breakfasts have increased from $68,000 in 2005 to $850,000 in the 2008-2009 growing season among SME producers in South Africa, Malawi and Zambia.
7) PFID/NP produced over 100 documents from 2004-2009. The new publications include natural product profiles, posters, product specification sheets, research papers, reviews, technical reports, training manuals, and new and improved product development in professional and natural products journals.

Suggestions for Future PFID/NP and ASNAPP Interventions

1. To reduce risk among small-scale producers in the production of natural products as well as to cushion the shock of fluctuating staple crops, PFID/NP and ASNAPP country programs will deepen and expand the base for key medicinal plants and spices combined with staple food crops to ensure food security while increasing income levels. ASNAPP/Senegal and Zambia have established intercropping and crop diversification systems between natural plants and staple crops (maize, millet, legumes, vegetables and cassava).
2. Natural predators (monkey, elephants, goats) invade production areas significantly threatening the quality and quantity of crop yields and sustainable harvesting. Strategies will be developed to work closer with wildlife agents and local village elders to quarantine or ward off encroaching animals.
3. To increase the number of jobs in rural areas and provide small-scale producers with greater profit and market share, PFID/NP and ASNAPP country programs will strategize to attract private sector investment in processing and value addition.
4. Given the significant results from lead farmer businesses' capacity to galvanize large numbers of collectors, farmers and rural producers to work together to supply large commodity contracts, PFID/NP and ASNAPP will further develop this business model thus bringing more informal enterprises into the formal business sector and creating thousands of jobs in rural African communities.
5. PFID/NP partnerships with local African universities and research organizations enormously augment local institutional capacity for research and development of raw and processed natural plant products. Identification of active chemical ingredients, lath house management, improving tissue culture capacity, improving the quality of germplasm and the production systems, branding certification of quality assurance and quality control systems, establishing standards for community and individual plant nurseries as well as researcher and professor exchange opportunities are just a few of the science based interventions proposed.
6. For the long term viability of PFID/NP and ASNAPP services, a sliding scale fee for services plan will be implemented. Many types will be tried to determine the most effective to include: check off system on quantity of goods sold, gradual percentage coverage against the total cost of the service or group or association purchase of goods and services.
7. Commercial banks and rural financial institutions, for the most part, have not participated in providing financial services (bridge loans, credit, savings) products

to emerging natural products enterprises. PFID/NP through ASNAPP has depended on various ad hoc methods to obtain funding for new natural product enterprise start ups. These methods include government grants, buyer funding, partnering with NGOs and other enterprise development funded projects, *etc*. Informing and educating financial services institutions about the enormous and growing natural products market will be a primary role of ASNAPP and PFID/NP in future work.

Several questions raised during the oral presentation of the draft report were posed to the implementers. Following are the questions and the responses.

What would PFID/ASNAPP do differently (better?) if more funding was available from USAID? Please discuss two scenarios: 1. another 5 years at the previous level of core funding (i.e., 250,000 -300,000 per year) and, 2. Another 5 years at a core funding level of $ 500,000 to 900,000 per year. This will include a discussion of what possible new activities might be envisioned during the next 5 years.

RESPONSE: With scenario 1 (continued funding at $250,000-$300,000); PFID/NP would likely be able to run the core program that continues to rely extensively on leveraged funding with a minimum core staff at Rutgers and one African coordinator located in overseas. The African coordinator would focus on market development and trade. This scenario would allow Rutgers and PFID/NP to continue to technically assist those dozens of micro-enterprises and the many companies overseas and in the US with whom we currently work and serve as an information nexus. This level of PFID/NP providing similar funding which we have received in the last few years could allow PFID/NP to interact with other USAID funded projects and programs, but not easily allow PFID/NP to work directly with many small and medium-sized farmers and African Women's Associations unless we continue to be successful in capturing leveraged funding. The low level of continued funding makes it difficult to operate effectively in six countries, to attract additional USAID funding and leverage others. PFID/NP would continue to make significant contributions and show a successful return on USAID investment. However, the efforts required for the Rutgers faculty to develop leveraged funding would detract from time on actual development assistance, thus limiting the successes toward USAID strategic objectives. In the next five years, such funding would focus our work in two main ASNAPP countries, with limited assistance to the other (current) ASNAPP countries. Also there would be limits to the focus on market development and coordination, quality control and travel to core and new countries to provide technical assistance. Introduction of the market-first science based models of community development and trade which we have developed would also suffer.

Scenario 2 (continued funding at $500,000-$900,000) would enable us to scale up to reach additional farmers and communities in each country where we now have successful commercial models. With increased funding, we would be able to address gaps in the natural plant product sector and increase the number of beneficiaries (farmers, the private sector, women) and even expand into additional countries when leveraged support is obtained. It would also allow us to expand and replicate the proven horticultural production and marketing partnership between the private sector and lead farmers/grower

communities that has occurred in southern Africa. This has resulted in increased production and sale of high quality horticultural products to partner countries and programs (The Gambia, Kenya, Tanzania, Malawi Mozambique, Angola). Expansion to other regions (e.g. southern India, LAC) would be possible where local support is provided. PFID/NP could serve as an information hub on the sustainable development and commercialization of natural products and the marketing and requisite science needed that would enhance trade and sustainability. PFID/NP would also then be in a position to strategically provide expertise and technical assistance to other USAID projects.

Relative to our current programs, with the higher funding level we would:

In Ghana:

- Significantly deepen our market development initiatives in spices by seeking partnerships to support commercial production by growers and working with major importers towards fulfilling the over >1000MT market orders for various spices valued at over $3 million ($US)/year, and in doing so bring into the program hundreds of additional small-scale growers. The higher funding level would enable us to put into place the support programs needed to strengthen the supply chain and ensure high quality. We already have buyers lined up and markets waiting for our willingness to participate.

- Train an additional >1,000 African women in the collection and handling of shea and continue support to the private sector processing partner on the processing of shea into cosmetic products. This would lead to over 1,000 MT/year of shea butter with a trade value of over $5 million (US)/year.

- Provide increased support to cultivate the leading medicinal plants that are currently only wild harvested. This would ensure compliance with quality specifications and establish Ghana as a leading supplier of high quality plant products, tapping into the growing medicinal exports markets currently estimated at over $20M per annum.

In Senegal:

The hibiscus project has been a successor to ground nuts engaging women as lead farmers and, thus, recipients of income. Increased funding would allow focus on: (A) increasing by 50% the number of beneficiaries (women) to about 6,000-7,000; (B) increasing the yields and production of hibiscus as the next step to increase profitability at the farm and community levels; (C) further examination of the use hibiscus as a rotational or additional crop within food security schemes; (D) developing the value-added opportunities such as herbal teas, hibiscus powder for the food/beverage industry, kinkeliba tea, bio-pesticides and honey, to diversify the production base. In short, we would seek to double our agriculture yields under organic and non-organic production systems, increase the relative amount of value-added processing of hibiscus into

final products sold locally, and nationally, and continue to increase the export of this product. The increased programmatic activities would lead to a doubling of farmers we have been able to impact and doubling the income and trade generated already by each commodity.

In Southern Africa (South Africa and Zambia):

Expand the horticultural initiative from Zambia and Malawi to additional regions in Malawi, Angola and Mozambique. Potential to include Seychelles will be explored as the private sector in that country has indicated its interest to work with ASNAPP.

In Zambia:

Increased funding would be used to address the following gaps: (A) Low volumes – the demand for spices (paprika and birds eye chilies) are woefully under supplied in southern Africa. Only 45% of the daily potential (10,000M) of a paprika processing plant in Lusaka is met by suppliers. 20% of the demand for chilies in Southern Africa, (5,000Mt worth $10M) is being produced. ASNAPP has been successful in commercializing these crops but there is more market demand. Given additional funds, ASNAPP would assist more farmers in the Chinyanja Triangle (Zambia, Malawi and Mozambique) to cultivate more spices. (B) A quick scan of some nearby countries to Zambia (Malawi and Mozambique) revealed serious quality gaps in the value chain from seed to market, in the spice industry. These gaps would be addressed to ensure production of quality produce. ASNAPP will partner with sister NGOs and other stakeholders in these countries to build capacities to address these concerns and also replicate some of ASNAPP's successful models in those countries. Previously there were five spice processing facilities in southern Africa, now there are three, each having difficulty in fulfilling their internal supply needs relative to market demand. Low volumes and quality gaps are among two of the major constraints that will be addressed. Expansion of the moringa enterprises to reach five new communities and regions of Zambia would be pursued.

In Rwanda:

Higher core funding would help Rwanda to diversify into additional essential oils and natural products like herbal teas and medicinals while still focuses on the expansion and strengthening of the geranium oil production. Phase 1 established the industrial base, brought on-line the processing facilities, and established the initial acreage. With these aromatic plants the yields increase over time (years) and the profits are in amortizing the investment of the processing facilities (the steam distillation units) by introducing additional aromatic plants to distill year round. It is in Phase 2 where the profits of the enterprise could be captured and strengthened. Thus, the next stage would enable us to reach more agro-processors in natural products and improve their quality; more

farmers would be engaged and trained and a greater number of communities more fully integrated into ANSAPP and essential oil and natural product production. These crops would all, as they do in each country fit into and complement the needs for each family and community to maintain and grow staple food crops as well. More work in moringa would be conducted.

In South Africa:

To graduate two additional herbal tea communities and introduce new communities in the Western Cape to herbal teas and botanicals.

Cross-Country: A regional Approach:

ASNAPP's market- first model has been successful as it ensures consistent market for farmers. Greater efforts will be channeled towards market development initiatives to ensure that farmers are apprised of current market trends to enable them to produce in accordance to buyer specifications. At Rutgers we would maintain and strengthen the needed science-based and Quality Control approaches which have been so successful. Rutgers would provide a strong market and trade focus by bringing in additional staff with specialized expertise in markets and trade.

Scenario 2 would allow us to strengthen capacity throughout the supply chain, particularly by reinforcing the knowledge base in quality control and assurance, applied research and development, commercial production of NTFPs, marketing and business development skills.

In sub-Saharan Africa, during an additional five years, PFID/NP and ASNAPP would continue facilitating the commercialization of natural products and develop strong programs of sustainability both at the NGO and grower/processor levels. We expect that PFID/NP and ASNAPP with increased funding level at ~$500,000-$900,000, would continue to significantly reach and benefit more than 10,000 farmers and assist in the generation of trade of, at least, $10 million per year (10-20 times the funding base).

This increased level of funding and the consequent impact on trade, would allow farmers to have access to food by helping to provide adequate incomes. Food access has been identified as one of the three distinct variables central to the attainment of food security. In addition, the staffs of PFID/NP and ASNAPP have been committed to assist these same farmers and communities in horticultural production and food crop production though outside their mandate. Natural products complement the need for small family farms and communities to raise some of their own food. The techniques and training provided and the healthy nutritional crops introduced by PFID/NP from moringa to food crops, have provided tremendous value beyond the markets and trade

emphasized and aligns itself well within the larger USAID strategic initiatives.

What is "special" or unique that gives ASNAPP and PFID/NP a competitive advantage. Why should USAID support this vs. another intervention?

RESPONSE: The uniqueness of PFID/NP and ASNAPP is in the market-first, science-based approach benefitting rural communities (mostly women) and the private sector in sub-Saharan Africa. PFID/NP is a unique, university-led, international development program with a capacity building and technology based approach. This program has been successful in leading to real trade, real impact and the formation and income generation for African small farmers, particularly African women. It merges the components from universities (Rutgers and African Universities, *e.g.* Stellenbosch, KNUST) such as applied research and development, teaching and trainings and services activities with the marketing and business skills from the country programs and private sector. This program is responsive to the marketplace, develops its research to support market and trade needs, and is truly a holistic program. It implements a commodity chain approach while purposefully exhibiting the flexibility to adapt to the myriad of local and country conditions. The market and trade expertise, the science and quality-control expertise, and the ability to work with other governmental, NGO and developmental organizations have allowed us to provide a unique blend of technical expertise and skills needed to go literally from seed or bush to final product. From the introduction of a totally new crop or the viable commercial production of a horticultural crop, PFID/NP and ASNAPP take a pragmatic approach and rely extensively on partnerships, particularly those in the private sector. PFID/NP involves local and national scientists, strong relationships with national governments, and a participatory approach. When speaking to the women in the community, the processor, the buyer, agent, dealer and government officials, this approach has lead to the building of a strong trust and confidence level with the communities and public/private sector partners with whom PFID/NP works and with the government officials with whom PFID/NP and ASNAPP work.

What is ASNAPP's vision for itself when USAID funding is no longer provided? Will it eventually be independent of donor funding? How would that be accomplished?

RESPONSE: ASNAPP is keenly aware USAID support is not unlimited. ASNAPP as a network and consortium including Rutgers and other of the key universities (e.g. Stellenbosch University in South Africa and KNUST, Ghana) have met several times to develop a vision for the future including developing a strategic plan of action for economic sustainability and programmatic expansion. ASNAPP has, over the past three years, been very effective in leveraging additional funding through country or regional missions of the USAID as well as non-USAID sources of funding, such as international funding agencies, national and provincial governments and private sector contracts. Given the unique expertise and services ASNAPP provides, the organization is putting in place mechanisms to allow it to charge a fee for certain services, particularly from the private sector in the areas of product mobilization and exports, quality control and

assurance and applied research. The plan is to use the next five years to consolidate and streamline our interventions and services to provide targeted responses to the private sector. These services will be offered at a fee that will contribute to the long-term sustainability and survival of ASNAPP. Also, ASNAPP intends to establish a private-sector arm that will be profit making and part of the proceeds from its commercial activities will be used to support the ASNAPP NGO in its respective countries of operation.

Will ASNAPP and Africa eventually (e.g., after 5 more years) be able to function without Rutgers' support for QC/QA and research?

RESPONSE: That is our intent. At the end of the first PFID/NP period (2004-09), Rutgers started to work with country programs, private sector and public institutions to enable the country programs and our partners to conduct research and development activities in the areas of QC/QA. Rutgers has spent considerable time in first developing the protocols needed and the approaches that meet industry needs; Rutgers then sought to develop the expertise and interest for in-country local scientists to take the lead in the QC/QA needs of the country or regional programs. Over these first five years, we have made some successes in this area. For example, there is now a modest natural products QC lab in Senegal outfitted by Rutgers through PFID/NP to assess the quality of hibiscus and kinkeliba. ASNAPP-Senegal and research staff at the University Cheikh Anta Diop of Dakar now routinely use this laboratory. Partnerships with in-country labs including University Cheikh Anta Diop of Dakar and the Pasteur Institute conduct all microbiological testing of ASNAPP products for food safety and microbiological contamination. In Rwanda, Ikirezi Natural Products, Kigali, has a modest lab to conduct sensory evaluation and physicochemical characters of essential oils. In Ghana, we are beginning to work with a private company that has been investing in an ISO compliant shea butter processing facility with Rutgers providing the expertise for them to develop their own internal QC/QA lab. Over the last 5 years we have been developing close working relationships with faculty members, in both Agriculture and Pharmacy at the Kwame Nkrumah University of Science and Technology (KNUST), and these groups have begun to address a number of QC/QA issues. In the next five years we hope that KNUST as well as the University of Ghana will have QC/QA labs that can cover much of the Ghana medicinal plants needs. In these first five years we began to work with University of Zambia and regional research institutes in Zambia and Malawi for them to begin to conduct QC/QA lab work and support for the paprika and African Birds Eye Chili but funding has limited the implementation of these labs to reorient their work to really include QC/QC focus. We anticipate that over the next five years, each ASNAPP partnering country will have active in-country QA/QC lab which would expedite the response time between growers and communities with processors in country, be used to further develop internal national capacity and expertise, enhance trade and rectify QA/QC concerns. Rutgers will, over the next five years, provide assistance to randomly validate in-country lab results and focus attention on national and international grades and standards. In-country labs will focus on food safety, product definitions and QC/QA issues from production through processing. Rutgers and ASNAPP have, over the last several years, developed the program, “Making Quality Matter” in sub-Sahara Africa that

has been given to public and private sector partners and the commercial industry in several countries (Ghana, Malawi, Rwanda, South Africa and Zambia). These workshops will continue though we hope that additional African scientists will begin to give more and more of the training. With increased funding for the next five years, all the countries programs should be able (in partnership with private and public sector) to conduct similar research and development activities to facilitate market access to their products.

Over the past 5 years, Rutgers has worked with institutions across Africa to build their capacity and that is something we are very committed to accomplishing. ASNAPP also intends to attract and encourage more private sector participation in this area so as to provide more sustainable funding and also ensure the continued relevance of research and quality systems developed. ASNAPP's current partnership with Stellenbosch University will also be strengthened to expand QA/QC.

Are beneficiaries (communities) made aware of the possibility that their competitive advantage in natural products production and marketing will eventually disappear? *I.e.*, What if other counties begin production or the market becomes saturated or climate change affects production, etc?

RESPONSE: Yes. PFID/NP and ANSAPP work hard not to increase unrealistic expectations and to be responsive to the needs and trends of the marketplace. In this way, our strategic plans tend to employ processes in which communities can take part in some aspect of the processing of a natural product. They are provided with strong training in agri-business aspects so that from the outset the growers and communities come to see natural products as a vehicle for income generation, for employment, for change and for crop diversification. The skills and training provided to grower associations prepare them for participation in the formal marketplaces and provide life and agricultural skills that can be used in the future to grow other food and income generating crops. These include basics on crop production, quality, careful attention to final product cleanliness, understanding of the marketplace, and empowers them to make their own decisions and to function independently. This development and foray into agri-business provides these women, and all growers, confidence and ability to consider and select future crops that could be profitable and/or needed for their own food security.

PFID/NP assisted communities are keenly aware of what has happened to the traditional crops that have long been exported from the continent. Natural products have been seen as a means to help diversify risk and reduce exposure to fluctuations in the traditional cash crop marketplace. However, the risks remain as long as natural plant products (NPPs) are promoted simply as raw material exports. Enterprise development discussions with communities have thus concentrated on developing models that ensures year-round income through mixed cropping. Additionally, communities are encouraged to plough back part of the benefits accrued from NPP activities to invest in other income generating activities. At a broader level, emphasis is placed on enhancing productivity and in-country processing and value addition to improve competitiveness. Thus, we envision the competitive advantage will be derived from processing of natural products and not simply be a source of low cost raw materials.

Communities are aware that unforeseen circumstances may ultimately change the market dynamics in natural plant products from Africa. ASNAPP has therefore not limited service delivery toward the few core selected natural products with which PFID/NP was started. There is diversification including specialty vegetables, small fruits, berries and mushrooms. These are niche markets which are generating substantial income to support farmers in Southern Africa and other regions.

Are there any thoughts about expanding PFID/NP beyond Africa?

RESPONSE: Yes. During the first PFID/NP period (2004-2009), we wanted to focus on strengthening our core programs and ensure deliver on each of the objectives. We do want to introduce the models we developed into countries outside Africa as well as expand the number of countries in sub-Sahara Africa where we now operate. We have explored the possibility of expanding the program to other countries (Jordan, Egypt, Brazil, Morocco, and Syria). However, due to a variety of reasons, mostly the lack of funding from the regional offices or the private sector, this opportunity has not yet been realized. With increased funding, and the help of USAID/EGAT, we would welcome expanding beyond Africa in the second round of 5-year funding.

Further expansion of ASNAPP in sub-Saharan Africa via PFID/NP would seem quite likely as those familiar with our program want us to initiate programs in their countries. This would include expanding our programs to include more African countries, and fully turn the satellite, *ad-hoc* programs in Malawi, Angola and Mozambique into fully-functional ASNAPP Programs (with Boards of Directors). There are calls from the private sector in Seychelles for ASNAPP's assistance to develop the horticultural and specialty vegetable industry in that country. In addition, we have been asked to come into Lesotho, Kenya and Swaziland.

To what extent are "buy-ins" and leveraged funding necessary for ASNAPP to continue operations and/or to scale-up? What are the requirements/expectations for Associate Awards from USAID Missions? What can USAID/Washington do to help Rutgers "market" the project?

The current and new "Buy-ins" and leverage funding have been required for our strong in-country programs and for any scale-up. In the absence of any leveraged funding our in-country programs would be reduced. Yet, even after local and regional missions know about our programs, it has been difficult to procure such "Buy-ins" as an Associate Award. One of the limiting factors expressed to us was that most regional and in-country offices were not at all familiar with the LWA mechanism. They are not aware of it as they plan out the number and nature of their procurements. Or, when they learn about PFID/NP and how to prepare an "Associate Award" they simply find it easier to add funds onto current contracts that they currently manage. Therefore, one of the ways USAID/Washington can help Rutgers market the PFID/NP project is to develop a proactive educational outreach program to regional and in-country missions. USAID/Washington did that with the GDA mechanism and perhaps the PFID, LWA mechanism can be fully integrated into the training and education presentations promoted

by GDA. USAID missions want to ensure that PFID's align themselves with their own strategic goals and expectations (now with an emphasis on food security) and that PFID can handle large programs and additional resources. To the extent appropriate resources are made available to PFID/NP this program can be highly synergistic to other Mission and regional programs and may excel in its ability to provide technical assistance, development markets, introduce improved germplasm, and lead to increased trade locally, regionally and internationally without the creation of another bureaucratic institution. In short, the PFID mechanism facilitates a streamlined, highly efficient, in-country and regional program that can easily be applied in different countries to support and extend the strategic objectives of the regional and Mission offices. PFID/NP can bring into the consortium any needed partnerships to accomplish the objectives while local and regional US staff provide technical and fiscal oversight.

In Ghana the "Buy-ins and leveraged funding" have proved invaluable and will continue to be critical if ASNAPP is to be able to provide the full range of interventions necessary to fully develop the natural plant products industry. PFID funds have largely covered core staff and administrative costs and some limited program activities, but it has also provided the requisite leveraging that has enabled us to attract substantial funding to support program activities. Associate Awards will be immensely helpful in providing sufficient cushioning that will allow long–term, proactive planning and implementation.

In Southern Africa (Malawi, South Africa and Zambia) "Buy-ins and leveraged funding" will continue to be critical for ASNAPP to provide and expand its services to emerging entrepreneurs in the industry.

In the potential five year renewal (2009-2014), Rutgers and each of the ASNAPP programs are expecting to need continued leveraged funding (including USAID country programs and non-USAID sources). The higher funding level would enable a significant greater impact from Year 1, increasing the total number of farmers and women farmers trained in the commercialization of natural products and significant expansion of markets and trade.

EVALUATION TEAM RESPONSES TO QUESTIONS IN THE SOW

1. **Has the Rutgers-led PFID/NP partnership made substantial progress in meeting the main objectives of the PFID/NP program as stated in the award and subsequent work plans?**
    a. Yes the Rutgers-led PFID/NP partnership has made substantial progress on all of the objectives identified in the PFID/NP program as stated in the award and subsequent work plan. See executive summary and country reports.
    b. The willingness of community partners, program partners, financial partners and USAID officials to provide letters of support for the great efforts of the ASNAPP team in accomplishing the objectives of the PFID/NP projects was a great sign of support for their past, present and future program efforts.

A PFID/NP Objective was to Increase the number of natural plant product producers/farmers

In 2004, the PFIDNP program involved 4513 farmers to produce 80 metric tons (valued over $7 million of botanical products (Figure 1). In year 5, PFIDNP is having and impact on 8000 farmers and they are producing 2700 metric tons of plant derived products valued over $15 million.

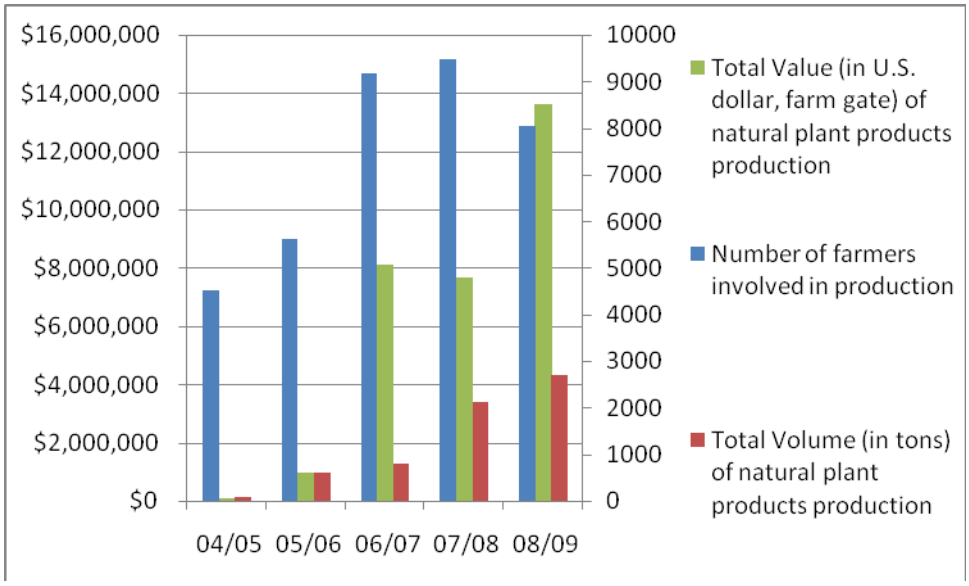


Figure 1. Number of farmers (blue bars) volume (red bars) and value (green bars) for the five PFID/NP years (the first, 2004/05 through the fifth year, 2008/09). Source: ASNAPP country data collected and aggregated by ASNAPP staff.

A PFID/NP Objective was to Develop (new) products for domestic and international markets

In 2004, PFID/NP program started working with 13 natural products as raw botanicals (Table 1). For the years 2 through 5, PFIDNP has been working on average with 17 different products (Table 1).

Many of these new botanical raw materials were commercialized for international markets. For Ghana these products include, Kombo, African Birds Eye Chili (BEC), Grains of Paradise and shea butter. Lippia and seeds of the allanblackia plant were produced in minor amounts.

In Zambia, the new products introduced with high economic return for both local and international markets include paprika and birds eye chili, though in Zambia other new products have been offered to the local or international markets. These products include Fadogia tea, Mungongo oil (also called manketi), and lemongrass.

Table 1. Natural products produced by PFID/NP countries through years one to five.

	Y1	Y2	Y3	Y4	Y5
Ghana	GOP[1]	Lippia	Lippia	Lippia	Lippia
	Lippia	GOP	GOP	GOP	GOP
	Voacanga	Xylopia	Xylopia	Xylopia	Xylopia
	Griffonia	Voacanga	Voacanga	Voacanga	Voacanga
	Culinary herbs	Allanblackia	Kombo	Kombo	Mondia
		Kombo	Griffonia	Griffonia	Kombo
		Griffonia		Mondia	Griffonia
		Shea		Shea	Shea
				BEC[1]	BEC
Rwanda	Geranium	Geranium	Geranium	Geranium	Geranium
Senegal	Hibiscus	Hibiscus	Hibiscus	Hibiscus	Hibiscus
	Kinkeliba	Kinkeliba	Kinkeliba	Kinkeliba	Kinkeliba
	Neem/Jathropha oil	Neem/Jathropha oil			
Zambia	Lemongrass	Lemongrass	Lemongrass	Lemongrass	Lemongrass
	Mungongo	Mungongo	Mungongo	Moringa	Moringa
		Geranium	Geranium	Paprika	Paprika
		Moringa	Moringa	BEC	BEC
		Fadogia	Fadogia		
		Paprika	Paprika		
		BEC	BEC		
South Africa	Honeybush	Honeybush	Honeybush	Honeybush	Honeybush
	Rooibos	Rooibos	Rooibos	Rooibos	Rooibos
	Total 13	Total 20	Total 17	Total 16	Total 17

1. GOP grains of paradise, BEC birds eye chili.

A PFID/NP Objective was to diversify the economy through new/improved natural plant products

The diversification of the local economies came mostly from the increased production of the different botanicals. In Senegal the increased production, especially in dried organic certified quality hibiscus, have contributed to significant increases in farm gate prices (as much as 40 percent in 2008) and ultimately, farmers' income.

In Ghana, the increased volume and value of production of Griffonia and Voacanga has also helped to diversify the local economies. Voacanga and Griffonia have been produced in close partnership with the Botanical Products Association of Ghana, the Ghanaian government and the private sector to develop trade standards.

The number of Agricultural firms and organizations that have benefited from PFID/NP interventions, training, counsel and technical assistance were 33 in year 1, 113 in year 2, 140 in year 3, 206 in year 4, and 204 in year 5.

In Ghana, in the second year, PFID/NP began organizing two producer associations for collecting Kombo nuts for processing the Kombo butter. The production was sold to the private partner, BRI who then further processed the product and exported it to the USA. In the last two years, PFID/NP in Ghana is producing high volumes (8 containers) of African Birds Eye Chili for private partner companies in South Africa. Ghana has also been producing small quantities (<1 ton) of Lippia tea for the local markets but also for the Mpuntu line of African teas. The Ghanaian office has also been involved in the commercialization of small quantities of Grains of Paradise seeds of Allanblackia.

The Zambian program has focused mostly on the production and large-scale commercialization of paprika (2 containers) and African Birds Eye Chili (3 containers) by many small farmers. These are two major natural products for the spice industry and for local and international markets.

A PFID/NP Objective was to increase the number of people employed in the natural product sector

Since 2004, the number of farmers involved in the collection and production of natural products has gone from 4,513 (Y1), 5,616 (Y2); 9,186 (Y3); 9,476 (Y4) and 8,050 (Y5). In 5 years the project has nearly doubled the number of people employed in this sector (Fig. 2).

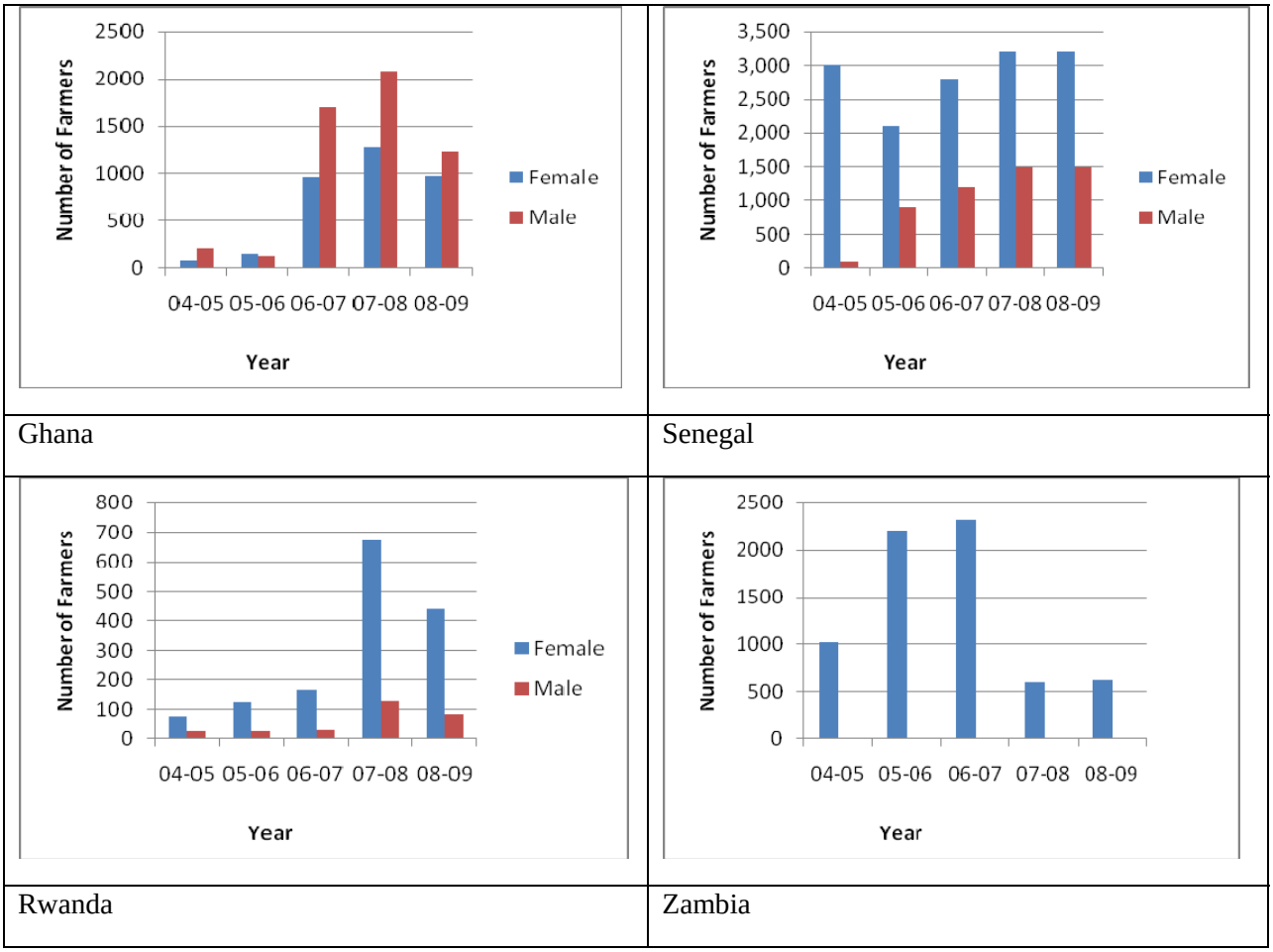


Figure 2. Number of farmers in Ghana (upper left), Senegal (upper right), Rwanda (lower left) and Senegal (lower right).

A PFID/NP Objective was to increase and diversify family/farmers/production income

The diversification of the production, as well as the volume and value of the production, has contributed to farm employment in PFID/NP countries, increasing both the number of farmers and their family income. This impact on the production and commercialization has been particularly significant in Ghana with the production of forest botanicals (Griffonia, Voacanga and Kombo). The production of botanical products in Ghana has increased from 47 tons in 2004 to more than 2000 tons in 2009, benefiting 1200 farmers. In Zambia, the production of paprika and birds eye chilies has been significant. For example in year 4, Zambia produced 220 metric tons of paprika and birds eye chilly valued at $375,000. Moringa, the new and indigenous tea Fadogia, and lemongrass have also contributed to both diversification and farmer income. In 2007, the private partner, Kalahari Natural Oils, produced 30 tons of Mungongo nuts, a non-timber forest product, for the extraction of plant oils for the local cosmetic industry. ASNAPP/Zambia and this private partner have also leveraged funding of approximately $40,000 to conduct training on sustainable harvesting practices and organic forest certification.

A PFID/NP Objective was to increase the number of sustainable natural plant products producers/companies

The model of development implemented by the PFIDNP program through sound science, technologies made available and training in the client countries has contributed to the generation of sustainable natural plant products. The training of farmers in good agricultural and collection practices, as well as organic and fair trade certification, has contributed to environmental sustainability incorporating socially sound practices. PFID/NP has significantly increased the numbers of those producers and companies. That is, PFID/NP has impacted on average 7368 farmers in Ghana, Rwanda, Senegal, and Zambia and Malawi, with the large majority being women.

A PFID/NP Objective was to increase the number of science-based natural plant products

The PFIDNP model of commercialization is “science-based natural products enterprise development.” The production of hibiscus in Senegal is a clear example. The use of science to assess the quality of hibiscus calyces permitted monitoring the quality of hibiscus during production and processing. After training in simple technologies Senegalese, women farmers, were able to produce high quality calyces, obtaining twice as much profit as compared with the conventional hibiscus. This is an example of value addition through improved quality.

In Ghana, the transfer of technologies to farmers through training on “do’s and don’ts” while processing forest products, also helped to increase the volume and value of production. Harvested wild Kombo nuts in Ghana were processed locally to achieve a value-added product, Kombo butter, at the community level. It was further processed and exported to the USA where it was converted into the richest plant source of the unusual fatty acid cetyl myristoleate (CMO) which is now on the market as a dietary supplement. African nutmeg (Kombo) is, at present, the only plant source of this unusual fatty acid used to reduce pain, stiffness in joints, and as a general anti-inflammatory agent.

Since 2004, PFID/NP has doubled the number of plants and natural products with which it works and which has lead to commercial trade opportunities.

A PFID/NP Objective was to increase the use of science-guided marketing of natural plant products

In the past, many herbal teas, spices and botanicals were collected or cultivated and then sold. This practice resulted in high product variability, inconsistency in quality, microbiological contamination, presence of non-plant debris, and adulterated products. PFID/NP introduced Good Agricultural Practices (GAP) for all field crops (i.e. rooibos, honeybush) and interventions specifically designed for all crops have been developed, though in reality not always implemented. All crops and products have been studied and product specification sheets prepared that define the product and ensure quality standards are met. In cases where no standards exist, PFID/NP has been developing such standards so that the collectors, processors, buyers, dealers/traders and regional and international buyers will understand the products and their quality attributes, thus providing a science-based approach with QC checking and assessments. The incorporation of local scientists and industries in a partnership with growers so that expectations are known in advance has established credibility between growers and buyers and is generating interest from new buyers. The science-led aspects of this program have been of great significance. All these activities have contributed to increase the market access and in some cases increase the value of the products. PFID/NP conducted research on all the crops and plant products with which it works. They have conducted and written an extensive array of technical reports which are then transferred and shared with African partners. PFID/NP has prepared scientific presentations to transfer information to others, and has published an extensive number of scientific papers on these crops and plant products which generate market interest and provide information to private sector partners.

A PFID/NP Objective was to establish or improve natural plant products regulation system (Comprehensive QA/QC, safety and health, sanitation and GMP).

ASNAPP has been involved with developing the Good Agricultural and Collection Practices (GACP) guide for medicinal plants (to PFID/NP) and has under this PFID/NP tried to implement these same recommended practices. In short PFID/NP has developed and continues to develop comprehensive QA/QC systems, and are primarily concerned with food safety (freedom from microbiological contamination) and sanitation. There are excellent examples: in Ghana with Griffonia and Voacanga; in Senegal with Hibiscus and Kinkeliba; in Rwanda with geranium oil; in South Africa with the herbal teas and in Zambia with paprika where collaboration with the government established the grades and standards of these products. PFID/NP has also begun to work on Good Management Practices (GMP) aspects.

2. **What are the strengths and weaknesses of the Rutgers-led PFID/NP partnership with respect to the overall PFID/NP objectives? Where successful, what factors contributed to the success? The team must fairly consider necessary changes to the plan caused by differences between planned and actual funding levels.**
    a. Strength: strong research team to answer questions on the chemical/elemental make up of the various plants that constitute the Natural Plant communities in each of the countries where PFID/NP projects are implemented.
    b. Strength: A dynamic leadership team led by Jim Simon that provides organizational leadership for the team and directs the continuous evaluations of the program efforts to keep them grounded in the goals and objectives to the project.
    c. Strength: Commitment from Rutgers to make the projects successful even when the funds were cut. They assisted the ASNAPP team to leverage funds to continue projects or to expand projects.

d. Strength: Rutgers has a historically strong program in horticulture research, teaching and outreach that was used to strengthen ASNAPP and the teams of local people, communities, associations, cooperatives, private companies, NGO's and governments to obtain the best possible economic and community changes.
e. Strength: The ASNAPP Africa implementing partners and their respective organizations and teams have been key champions working synergistically with Rutgers and in ensuring project success even when funds were reduced.
f. Weakness: Loss of funds that were committed to this project by USAID. Rutgers was not in a position to replace these funds or have them reinstated by USAID.
g. Weakness: There was no way for Rutgers to contract with someone to provide additional staff and community training on all phases of marketing in all countries. This lack of expertise in the field hampered some of the marketing efforts.
h. Factors contributing to the success of the team were:
    i. Strong commitment by Rutgers to make the project a success
    ii. The development of a strong team that reached from the village in each country to the leadership of the PFID/NP effort.
    iii. The development of an interactive model that enabled changes in the project as based on the needs of those presenting the programs and those receiving the programs. This model made the technology transfer to occur seamlessly and with greater long term impact than if it has only been a traditional top down program.
    iv. Strong commitment by the communities involved in the programs. They are very committed to insuring that the changes made in the first 5 years will be strengthened in the next five years. In fact they are so committed to this institutionalization of the changes in their communities that in the future they will change the way they work with Rutgers, ANSAPP and other NGO's to insure that they are in partnership relationships that benefit them and not in the recipient position always asking for the same help each year with no hope of change.
    v. The programs established a method of training that gives all the participants the skills necessary to become independent at some immediate future time. This enables the communities to become full partners in the continuous development of the Natural Products marketing chains. It also develops local experts that can provide training and support for additional development projects in their communities.
    vi. The program did not just focus on the production level of needs. They also gave programs on the management sole proprietor business, cooperative organizational management, value added marketing, post harvest care, people/labor management, time management, crop rotation, intercropping, pricing, packaging,

labeling, basic crop development techniques, rules and standards development and working with officials and agencies to obtain needed assistance.

3. **Has the Rutgers-led PFID/NP partnership made substantial progress in meeting the objectives of the program activities outlined in their PFID/NP leader cooperative agreement with USAID?**
    a. Yes the evaluation team found that the Rutgers-let PFID/NP partnership has made substantial progress on all of the objectives identified in the PFID/NP program as stated in the award and subsequent work plan.
    b. Observations and answers to evaluation team questions by community participants, country public officials, trade associations leaders, USAID mission and project leaders, business owners, other universities in Southern Africa and program partners validates the information in the reports from PFID/NP and ASNAPP.
    c. The willingness of community partners, program partners, financial partners and USAID officials to provide letters of support for the great efforts of the ASNAPP team in accomplishing the objectives of the PFID/NP projects was a great sign of support for their past, present and future program efforts.

A PFID/NP Objective was to align PFID/NP and the strategic objectives of the USAID country missions

The activities of the PFID/NP program are aligned with USAID strategic objectives in each of the countries where the program is operating. This was verbally confirmed by USAID representatives in the three countries visited by the evaluation team.

USAID Ghana strategic objectives

In Ghana, PFID/NP is contributing to the USAID/Ghana Strategy Statement "Empowering Ghanaians through Partnerships to Build a Prosperous Nation".

The PFID/NP program in Ghana is partnering with public and private organizations to leverage funds to support the commercialization of plant products through research, field testing, transferring of technologies, and an intensive program of capacity building for farmers and private sector companies.

Promote Private Sector Competitiveness (Economic Growth Strategic Objective) 2006-2010

In Ghana, the PFIDNP program is specifically addressing this strategic objective, by providing training and world class science in partnership with the BOTPAG and the Ghanaian Standard Board, to increase the competitiveness of the private sector by producing high quality products and developing trade standards. The trainings in production and processing of natural plant products have been key to increasing value and market access. The increment of competitiveness has been reflected by increased production and value.

Expanding Export Opportunities

One of the milestones of the Ghanaian program has been the re-launching of BOTPAG to revitalize the natural product industry in Ghana. This is having an impact on the export industry

for natural plants products. For this year, Voacanga has been the leading export product of the PFID/NP program, generating 2,000 tons, valued at $12 million and involving 3,000 farmers. Voacanga seeds are exported to international companies to extract alkaloids for the production of pharmaceutical drugs and supplements.

For USAID, the establishment of strategic partnerships between Ghanaian businesses and buyers in the U.S., European Union and other countries is a core component of the Economic Growth Strategic Objective. Thus, PFID/NP is partnering with the New Jersey based company, BioResources International, to produce Kombo butter for the international markets. For this year the production of Kombo nuts and Kombo butter has benefitted more than 100 farmers and collectors.

USAID/Ghana's strategy is focused on empowering individuals, communities, local and national government institutions and non-governmental organizations to attain Ghana's development objectives. Thus, PFID/NP in Ghana is empowering communities with a comprehensive approach that includes technology transfer coupled with a strong capacity building component. Throughout the past five years the PFID/NP program has trained more than 1,600 farmers on production and processing of valuable natural plant products. The PFID/NP program is also working in partnership with the Ghanaian Standard Board, universities and research institutions for the empowerment of institutions for the development of research capacity and trade standards.

USAID/Senegal's strategic objectives.

USAID/Senegal's strategic objective of Increased Economic Growth through Trade and Natural Resource Management.

The PFID/NP in Senegal has been addressing economic growth, trade and natural resource management. During these five years, the PFID/NP program in partnership with AES, has been contributing to the generation of trade opportunities for 3200 female and 1,500 male producers in Senegal. The program has increased the production of natural plant products, from 29 tons of street quality products to more than 240 tons of high quality products for international markets. The production of hibiscus for year 2008 is valued at $270,000, thus clearly increasing the commercialization of non-traditional agricultural and natural products. The PFID/NP communities have also been trained in organic production and are producing organic certified hibiscus. In addition, some of the communities are now fair trade certified. Both the organic and fair trade production of hibiscus are also addressing natural resource conservation issues.

In Senegal PFID/NP has implemented multilayer, value addition, strategies that include quality, organic and trade certification. This has contributed to tripling the price the farmers are getting for their hibiscus calyces. Through this model, Senegal is addressing the three components (economic growth, trade and natural resources) of this strategic objective.

USAID/Rwanda

Promoting Rural Economic Growth

The PFIDNP program in partnership with the community based business, Ikirezi Natural Products, and World relief is expanding agribusiness opportunities though the production of organic certified essential oils. Ikirezi Natural Products is a community based company that was initiated as a result of this project. In 2005, the company began impacting 100 farmers and now is benefiting more than 500 farmers, of which the majority is female. Ikirezi is beginning to produce essential oils in commercial quantities and 240 tons of high quality, organically certified,

geranium oil, valued at $33,000, were produced in 2008. The production is sold to the PFID/NP partner, Tuebes International.

The PFID/NP program has been providing research support and technology transfer on the production, distillation, quality and chemistry of essential oils. Ikirezi Natural Products also provides regular training on production and processing of essential oils and other crops used in nutrition.

Ikirezi Natural Products, and World relief have been recognized at 2 recent events. A speech by Henrietta Fore, the USAID Administrator in November 7th, 2008, and the 2008 White House Final Report titled : "Innovations in Compassion." While World Relief and Ikirezi are highlighted, it was PFID/NP's technical and NP program that provided the technical advice and expertise that made the project a success.

USAID/Zambia, strategic objectives.

USAID/Zambia - Rural Economic Growth Program Strategic Objective No. 1-Increased Rural Incomes.

Increased Private Sector Competitiveness

According to USAID Zambia, some of the main constraints to agricultural development and small-scale rural agribusiness competitiveness are: poor market access and under-developed markets that limit production; low farm and firm-level production and productivity due to inadequate provision of technical information, limited use of modern production and value-adding technologies; and absence of business management services.

The PFID/NP program and ASNAPP Zambia have been working on technology transfer and capacity building to increase the volume and value of production. The program began producing 4 tons of products. ASNAPP Zambia currently produces 161 tons of products, of which paprika and birds eye chilly are the most important. The PFID/NP-ASNAPP model of capacity building contributes to increased production. ASNAPP Zambia has provided training on agricultural productivity and technology transfer to 700 male and 553 female farmers on a yearly basis since 2004.

The PFID/NP model also implemented a science based approach to commercialization. By proper germplasm selection and the application of good agricultural practices farmers were able to produce higher volumes with higher quality.

The ASNAPP Zambia office has been working in partnership with private companies both from the local and international markets.

4. **Have the activities of the Rutgers-led PFID/NP partnership contributed to the strategic objectives of EGAT/AG and the USAID country missions where it has been operating? What have been the benefits to USAID and the host countries?**

The project, as documented in periodic reports, contributed to:

a. The economic improvement of the people at the family and community levels.
b. The security of the food supply for families and communities.
c. Access to marketing chain programs for individual women and groups of women.

d. Diversity of crops available for basic production.
e. Diversity of marketing of products from local direct marketing to international partnerships.
f. Increase in the stability of communities by offering opportunities to women, youth and young adults to participate in the production and market chains for Natural Products and horticulture crops.
g. According to one official, "this is a small program doing great things but it is below my radar as I have so many bigger projects to manage".
h. PFID/NP is making a difference where it counts and for the long term.
    i. A USAID official said, "I wish we could take your model and make it bigger so we could get more funds for it." The ASNAPP model is successful because it is market-driven, participative, flexible in delivery methods, and driven by the goal to make people independent in their production methods.
    ii. If USAID decisions are based on how to spend large amounts of cash in a short timewith companies that know the system so they can "SHOW RESULTS NEEDED," then smaller effective programs like ASNAPP doing great projects like PFID/NP will never receive the funding and support that is necessary for them to be successful in taking people from where they are to where they want to be. (Jim Freed)

5. Based on the activities in the first five years of the program, what is the potential for the activity to contribute positively to economic growth by the end of a five-year extension of the program, in the countries where the program has been operating? Have USAID funds been invested in projects that are likely to produce a positive return on investment (in terms of economic growth in the food industry) by the end of the activity?

a. Not only does it have the potential but it is doing it right now.
    i. In Ghana alone PFID/NP efforts have increased the market for two products (Griffonia and Voacanga) from 3 million dollars US to 20 million dollars.
    ii. In Zambia they are helping local villages and private businesses access markets that are both sustainable and expanding for vegetables, flowers, herbs, spices and fruits.
    iii. In Senegal buyers and the Food Technology Institute both commented on the increase in quality that added great value to the Hibiscus crops provided by the villages of Senegal that were trained by and working closely with PFID/NP. We were told that if the program could be expanded while maintaining quality that there would be no problem in finding markets for these crops.
b. USAID funds have been invested in projects that are having positive returns right now. They are also being used to leverage additional funds from NGO's, governments, universities, private business and producer/exporting councils.

To accomplish the PFID/NP goals significant funding was leveraged

Since 2004, the USAID office of Economic Growth and Trade provided $2.359 million to Rutgers University to implement the PFID/NP program. Of this total amount, 44% was transferred to Africa, while 33% stayed at Rutgers for programmatic activities and 23% absorbed as indirect costs. Of the core PFID/NP funds that went to Africa ($1,033,167), Ghana received $655,444; Senegal, $268,323; Rwanda, $51,000; and South Africa, $28,400. The transfer of funds into all the African countries was done through the leadership of ASNAPP-Ghana which received a subcontract from Rutgers University. To accomplish the goals of the program, additional leveraged funding and partnerships were required.

For example, to strengthen programs in southern Africa, Rutgers University and the PFIDNP program were able to leverage almost $1.6 million from additional USAID sources. This included "Higher Education for Development" (formerly known as ALO) and an Associate Award from USAID Southern Africa office. Of this $1.6 million, 74% was transferred to South Africa (60%) and Zambia (14%), while only 16% was used by Rutgers for programmatic activities and 10% assessed as the indirect cost.

To strengthen the program in Ghana, ASNAPP-Ghana was able to receive leveraged funding of $212,632 which was awarded from other sources, such as TIPCEE (An USAID/Ghana funded project) , the Ghanaian government and others. In Senegal, PFID/NP has been working in partnership with AES. The AES partnership generated a leveraged funding of $200,569. The greatest leveraging was in Rwanda, with a total of $683,000 in partnership with World Relief, and largely generated with a GDA grant (partially USAID supported), the government and non-profit organizations.

Since 2004, and considering all the USAID funds that came to Rutgers, 46% were transferred to Africa (Ghana, Senegal, Rwanda, South Africa and Zambia), 26% were used in direct support of the Rutgers University program and 18% were indirect costs.

When aggregating all the funds generated since the initiation of this PFID/NP program, a total leverage funding of $6.25 million was achieved. The majority of these funds were used by Southern Africa (38%, $2.4 million) (South Africa, and Zambia), Ghana (14%, $868,076), Rwanda (12%, $734,000), and Senegal (7%, $468,892). Of this total amount, Rutgers used 18% ($1.1 million) with an indirect cost of (11%, $706,087).

The total cost ($6.3 million) of this international development work, has impacted 7,000 farmers annually, benefited almost 700 organizations, formed 130 partnerships, provided 500 workshops and trainings and dealt with 350 technologies. This impact on the natural plant product sector has generated $30 million in trade.

6. **Has the Rutgers-led PFID/NP partnership obtained and/or leveraged additional funds utilizing either the USAID Associate Award mechanism or from other sources? If so, what are the sources and what programs are they funding? If not, why not, and what are the prospects for this PFID/NP partnership to obtain and/or leverage additional funding during a five year extension of the cooperative agreement?**
    a. Yes the Rutgers-led PFID/NP partnership has obtained funds from many sources. (See Question 5 above).

b. The evaluation team met with many of the financial partners who are providing support for the PFID/NP project. Their comments support the information that the Rutgers-led PFID/NP partnership has presented.
c. The funds were used for program support, travel, supplies, and all the different small and large needs that come with supporting programs in six countries in Africa.
d. The potential for renewed partnerships is very solid.
e. The potential for new partnerships is limited only because of the lack of staff to conduct fundraising efforts without jeopardizing program efforts.
f. The staff and advisory committee are exploring ways to generate funds by charging for some of the services they provide to the more established businesses and organizations with which they work. In our visit with one processor/exporter he stated, "I am willing to pay a percentage now for what I receive, I am more than willing to enter an agreement for future help that will be based on my export sales".
g. The program members, the staff, the partners and the existing funding sources are all very pleased with the return on their investments.
h. The evaluation team suggested that the ASNAPP team look at what they are doing and place a dollar value on it. This will show the program recipients what it is costing to have the PFID/NP program.
i. The Team also suggested that they develop a survey tool that can more accurately measure the real impact to the local communities not just to the program recipients. In the case of one community there were 11 women producing butter from tree beans, but the impact did not stop there. Two men were hired to run the milling process that also processed another native plant crop as well as maize for the village. There were over 110 harvesters who picked and sold beans to the women for processing. There were fire wood processors who sold fuel wood to the women to fire their cookers. This was not unique to this village. It was evident in every stop from the most remote hibiscus producing village to the tea packaging in downtown Dakar.

Partnership for Food Industry Development/ Natural Products

Country Programs Visited

Zambia

Once the weakest program regarding increased number of producer associations assisted, increased market access, and trade and volume of production, ASNAPP Zambia is now the centerpiece of the PFID/NP and ASNAPP country programs network. Geographically focusing on Lusaka, Southern, Copperbelt and Eastern Provinces, ASNAPP/Zambia focus crops include: paprika, birds eye chili (BEC), moringa and lemongrass with total sales valued at $23,000 in 2004 soaring to over $$450,000 in 2008. Benefiting from Zambia's abundant land and water and the Zimbabwe current political, social and economic meltdown, ASNAPP Zambia employs aggressive community based and lead farmer business models: to transfer 23 technologies; to work directly with over 1,253 rural enterprises; and 38 (predominantly women) producer associations since 2004.

ASNAPP/Zambia is a free standing NGO led by a private and public sector advisory board. Each year, the project receives an annual financial audit. Country program operations are managed by a country director, two technical and one administrative staff. PFID/NP conducts all chemical analyses for product development trials. PFID/NP also provides "Making Quality Matters" Workshops in Zambia and in the satellite office in Malawi.

PFID/NP contributions to ASNAPP/Zambia are significant. The program contributes to USAID/Zambia Strategic Objective #1: Increased Rural Incomes. More specifically, PFID/NP contributes to market access (Zambia Essential Oil Company and additional South African firms)[1], most significantly to paprika and BEC, moringa and lemongrass; and also to increased productivity through the transfer of modern production technologies and value adding technologies.

However, the two strongest components of the Zambia program are crop diversification and private sector partnerships. Faced in 2007 with the global food price inflation crisis, ASNAPP Zambia encouraged farmer enterprises to intercrop natural plant products with staple crops. For example, moringa and paprika intercrop well with maize, cassava and legumes. By limiting farmers' risk of investing in alternative crops via intercropping, ASNAPP targeted producer associations were better able to absorb the commodity price shock from 2007 to the present.

ASNAPP/Zambia's second strength is leveraging private sector partnerships to gain greater market access and increase availability of financial, logistical and human resources. In 2005, ASNAPP/Zambia hosted an African natural products roundtable for over 200 participants from 14 African countries, Europe and the U.S. at Sun International Hotel in Livingstone, Zambia. The hotel management, noting the enthusiasm of the participants, the technologies demonstrated at the conference, and the zeal of the ASNAPP team requested assistance in producing quality food for the hotel chain. Four years later, ASNAPP has generated 246 farm enterprises supplying approximately 6.5 tons (85 percent of the fruits and vegetables) to hotels, guest houses and supermarkets in the Livingstone area.

In 2006-07, the team successfully hosted the Southern 'Making Quality Matter' Workshop for industry players in the horticulture and natural products sectors. Over 150 participants from the private, public, research, NGO and farmer groups attended the workshop. A Southern African Paprika Association was formed to help develop the paprika industry. As the result of these activities, the team has been working with 650 farmers. Since 2006 the production of paprika has reached the 300 metric tons level with a value of $400,000. Since 2005, the team is also working in Zambia with other crops, that include lemongrass (40 tons with a value of $25,000), fadogia tea (3 tons, $8000), and manketi fixed oil (500 kg). New orders by Forbes International have now led to the tripling of paprika production and sales and new orders for African Birds Eye Chili are being met by over 2,000 small-scale farmers in Zambia, Malawi and Mozambique.

[1] South African companies are Papriex, Van Wyk and Forbes International

Senegal

An interesting point to note when observing program development and delivery across PFID/NP and ASNAPP countries is that no two countries have the same corporate or operating culture. The Senegal country program was born from a request by the First Lady, Mrs. Viviane Wade and the NGO, *Association Education et Sante (AES).* Mrs. Wade wants to improve the health and welfare of Senegalese women, especially those living in less than favorable environments. A quick market study indicated that two commodities had excellent local, regional and export market opportunities: hibiscus and kinkeliba.

Given the need to rapidly increase production and quality of hibiscus and kinkeliba, the project is led by an extension worker and an excellent agronomist. The ASNAPP project complements AID/Senegal's natural products activity, SAGIC, and ASNAPP receives funding from the mission. Before ASNAPP started, an assessment identified four constraints that precluded improved production and quality of kinkeliba and hibiscus: low yields; low farmgate price (approximately $1/kg); low production volume; and poor crop management.

PFID/NP made the following interventions: (1) supplied improved seeds and seedling technologies for hibiscus; (2) introduced seed pod removal device for hibiscus; (3) introduced good agricultural practices; (4) instituted vigorous quality systems; (5) trained 4,000 women annually; (6) trained 40 extension officers annually; and, (7) linked growers to buyers. Also important, ASNAPP introduced intercropping of hibiscus with cassava, cowpeas and millet.

The government of Senegal so appreciated the PFID/NP and ASNAPP that it supplies 35 percent of the annual budget in cash and in-kind. Furthermore, ASNAPP was asked to shape a new National Hibiscus Initiative. Beyond the aforementioned, the PFID/NP and ASNAPP results include: (a) 350 hectares of organic certified hibiscus and 200 hectares of ECOCERT/NOP certified hibiscus; (b) improved quality leading to improved farmgate price of $2.2/kg; (c) reduced planting time from 14 days to 2 days per hectare, saving the farmer $90/hectare; increased marketing opportunities (ASNAPP farmers sell to ADINA, USA, a French company and on the local, Senegalese market).

Kinkeliba is a real ultra poor household crop. Sustainably harvested, it is the crop that generates income between planting seasons in Senegal. The head of the kinkeliba women's group in Kaolack said, "If it were not for kinkeliba and ASNAPP finding us kinkeliba markets in Dakar, our members and their families would have nothing to eat!"

In addition to AES, PFID/NP has numerous partners: University of Dakar, *Institut de Technologie Alimentaire (ITA),* Seriex (tea and spice company), ADINA, and AID/Senegal are the most prominent. ASNAPP/Senegal staff are well known in rural areas for their radio shows on the production, quality control and marketing of hibiscus and kinkeliba.

While science-based market development has dominated the PFID/NP and ASNAPP Senegal agenda, one important and final intervention warrants attention. Excellent

adaptive research has been undertaken with assistance from the government of Senegal and private companies on Artemisia plant production, especially in hot, dry climates. PFID/NP worked with several Senegalese institutions on Artemisia and Artemisin levels as a part of the national government's efforts to fight malaria. The Artemisia research continues and interest mounts over the potential of a private and public sector venture to produce Artemisia in Senegal.

Ghana

ASNAPP/Ghana and PFID/NP intervene primarily in natural product policy analysis and formulation, quality assurance and quality control systems, researching the domestication of wild medicinal plants along with developing cropping modules and trade. Once again, PFID/NP and ASNAPP tailor program interventions to the need of the industry in country. Managed by a two person office, a country director and an agriculture development specialist, the host country office stimulates product information exchange, establishing quality control systems and market access for the following crops: Grains of Paradise, Birds Eye Chili, Voacanga, Griffonia, Shea Butter and Kombo Butter.

PFID/NP has made significant contributions to its partners and product development in Ghana. And, it should be noted, PFID/NP and ASNAPP/Ghana assist producers associations and enterprises to target inter-regional and U.S. markets. Most of the interested generated in the aforementioned commodities originate from well established markets looking for the next generation of scientifically researched natural plant products.

Major commodity successes emanate from Griffonia, Birds Eye Chili, Voacanga, Lippia and Kombo Butter. Here are the most impressive examples. Back in 2004, Griffonia (as the source of 5-Hydroxy-Tryptophan) used to suppress anxiety, alleviate depression and weight loss, and Voacanga, used for memory enhancement respectively, had no standards and was traded *ad hoc* on the international market including the US, valued at almost $3 million annually. In 2008, with direct intervention from PFID/NP and ASNAPP/Ghana, Griffonia and Voacanga have well established standards and value of trade soared to $20 million in 2008[2]. Much of the shipment goes to the Far East and Europe for processing but ends up as finished products in the US market.

Voaconga africana contains several alkaloids used for the treatment of Alzheimer's and Parkinsons, as well as treatment of withdrawal symptoms in alcoholics and drug addicts. In 2004, Voaconga was plagued with poor quality, priced at $1.50/kg, export value of $1.5m, complaints by importers and frequent disputes between exporters and importers. PFID/NP and ASNAPP interventions included training 2000 collectors, 400 collectors and 30 exporters in QA/QC systems, introduced electronic trade and mobile telephone trading platforms as well as training 3,600 collectors annually in sustainable harvesting and post harvest techniques. Results: Voacanga export prices, in 2008, were $6/kg and

[2] The team was told that the value of griffonia trade is grossly underestimated by exporters to avoid taxation and government scrutiny. The value of trade is at least twice what is reported. We could not verify this.

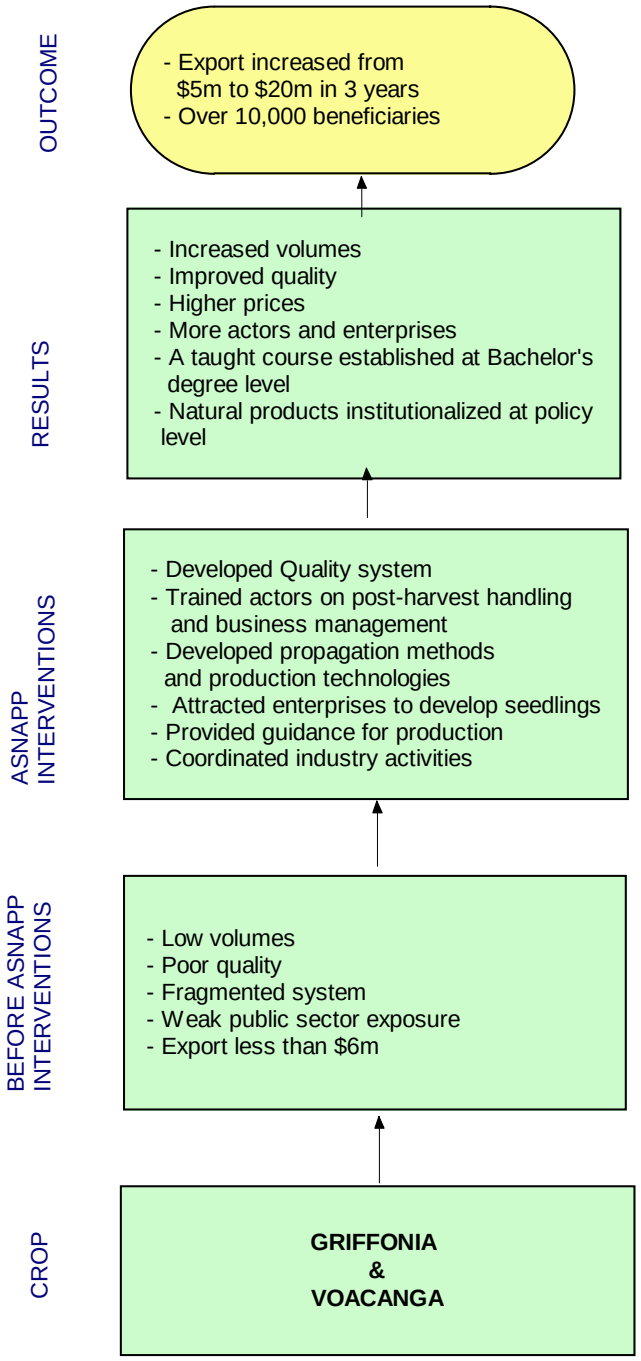
export value of medicinals increased to $20 million. Average income per collector stands at $1,200/annum providing collectors with a 30 percent increase in profit margins. Finally, transaction time was reduced from 61 to 29 days.

Final example includes bird's eye chilli. Starting in 2009, this product faced severe quality assurance issues. With producer training in quality control and using quality seeds, PFID/NP and ASNAPP/Ghana shipped eight 20 ft. containers to two companies, Dynamic Intertrade and Forbes International in South Africa.

PFID/NP has strong partnerships in countries that enable the above accomplishment to reduce poverty, hunger and malnutrition among Ghana's small scale producer associations. The Forestry Commission, Kwame Nkrumah University of Science and Technology, Center for Scientific Research into Plant Medicine and the Ghana Export Promotion Council have enable PFID/NP to carry out research and development supported by relevant policy analysis and formulation. BioResources International, Barbex Technology, Ghana Federation of Traditional Medicine Practitioners, Clives Teubes Inc (South Africa), Scatters Oil CC (South Africa) and Dynamic Intertrade (South Africa) and The Pure Company (Ghana) provide markets for some of the products mentioned above.

Three models showing achievements of PFID/NP and ASNAPP in Ghana were provided by the Ghana team and are shown on the following pages.

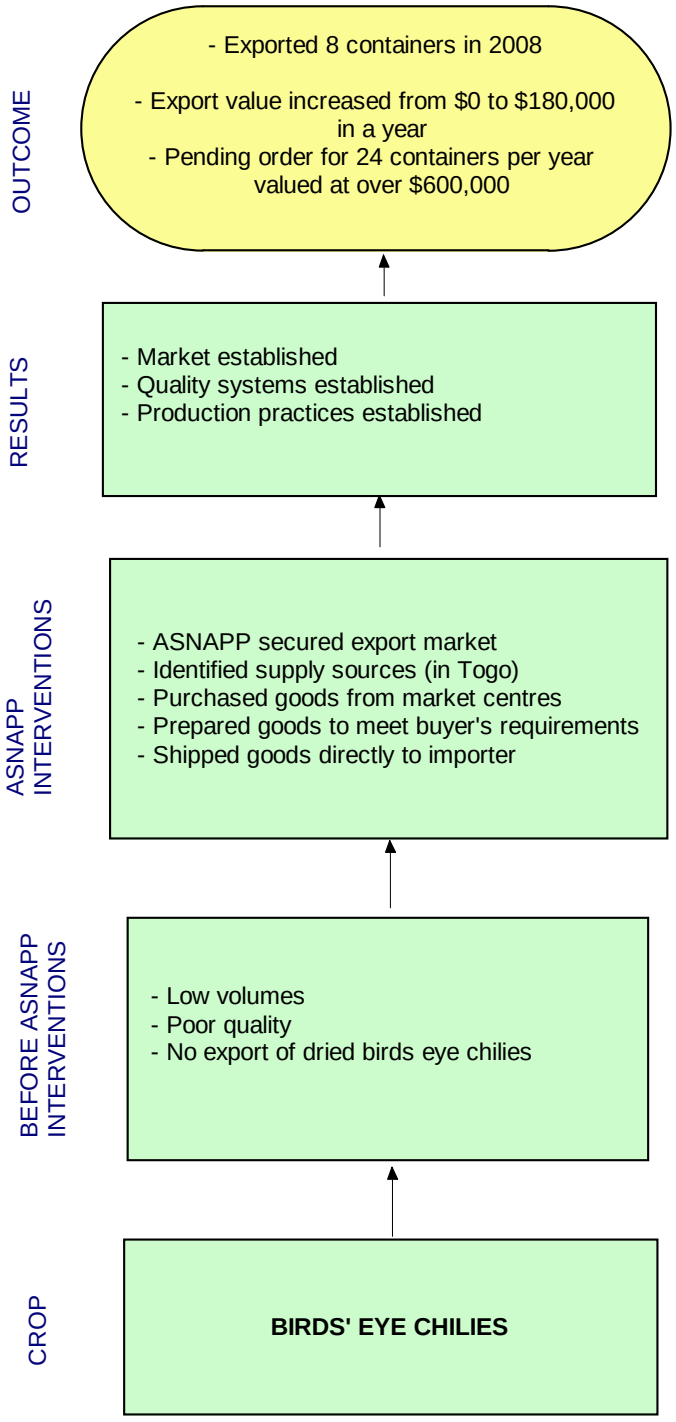
INCREASING TRADE
ASNAPP APPROACH
MODEL 1: INDUSTRY WIDE APPROACH



KEY APPROACH

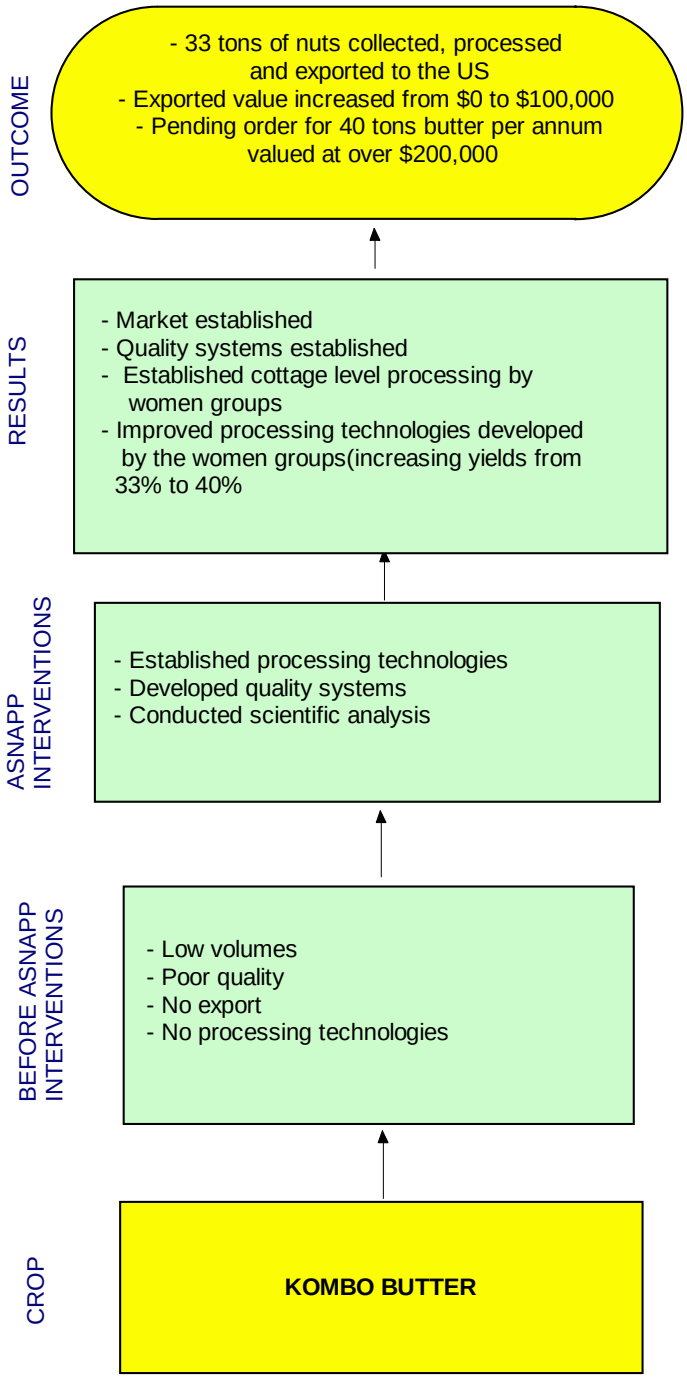
Industrywide approach involving several service providers and key industry actors. Service provision through the entire supply chain
Strong research, quality systems, industry coordination

INCREASING TRADE
ASNAPP APPROACH
MODEL 2:BUYING FROM MARKET CENTRES FOR EXPORT



KEY APPROACH
ASNAPP acted as an export organization; purchased and shipped goods directly to an importer

INCREASING TRADE
ASNAPP APPROACH
MODEL 3:LINKING PROCESSORS/SUPPLIERS TO EXPORT COMPANIES



KEY APPROACH
ASNAPP provided technologies for harvesting and processing; supported cottage level processing and provided market linkage for processors to supply exporters

PFID/NP Rwanda (Not visited by team)

PFID/NP, in line with USAID's support to the Government of Rwanda's goals set forth in Vision 2020 and the Economic Development and Poverty Reduction Strategy (EDPRS) is helping to revive the essential oil industry in Rwanda. In 2004, ASNAPP Rwanda focused on assisting two groups each comprising about 100 people, the majority of them women (widows and orphans) (Figure R2). As part of Rutgers research and technical support, PFID/NP helped upgrade the essential oil industry to reach international standards.

When the project and concept first began the geranium that was produced was not found to be acceptable by the international marketplace. PFID/NP and ASNAPP intervened and with assistance from a private sector partner, Clive Teubes International, and a private South African nursery, it obtained the correct chemotype, clonally propagated the "Bourbon geranium," and flew the correct and improved plant materials to Rwanda where the new fields were established and the project took off.

Today, the PFID/NP partner organization in Rwanda, Ikirezi Natural Products produces high quality geranium oil, accepted by the industry as the top quality Bourbon Geranium Oil. Production of essential oils is now being expanded into three areas in Rwanda. The entire yield is purchased by a private sector African buyer, Clive Teubes International (Johannesburg, South Africa), who sells this product on the global market. It required several years of market testing by Tuebes International to successfully introduce this geranium oil as a Bourbon type. This type commands the highest price and is in the highest demand. Several other essential oil buyers in the UK and USA have expressed interest in purchasing these oils.

This year, Ikirezi Natural Products is beginning to produce oils in higher quantities, 240kg valued at $33,000. The profits go to the widows and orphans that currently include almost 500 farmers. Other activities of the PFID/NP team include capacity building, technology transfer, distillation processing, quality control and economic analyses. The government of Rwanda is now interested in using this model to expand its development efforts. Spin-off benefits have resulted since the women became organized under this program for the production of geranium. New essential oil crops are now being introduced, and the women with their own leadership and drive brought in a Master Craftsperson to show them how to weave and make traditional reed baskets, which further contributes to their economic independence and income generating activities.

Household level impact from this project is significant. Sixteen women have completed building their own houses. An additional 16 are currently building their houses. Concurrently, the women have developed side vegetable production and marketing businesses on the Kigali market. The government of Rwanda considers the ASNAPP/IKirezi model a real success and has begun to replicate it with other women and orphan organizations.

The project has done well regarding partnerships and leveraging PFID/NP funds. In 2004, World Relief, in partnership with PFID/NP, was awarded a GDA grant, "Development of the Essential Oil Industry in Rwanda for Economic Growth and diversification" for a total of $450,000 for three years (2006-09). Additional leveraged funds included $100,000 from US Development Funds (2006-07) and $113,000 from the Rwandan Government through the Rwanda Horticulture Development Agency. The challenge will now be how to maintain this program with the ending of the current GDA and how to expand the acreage, involve additional communities, and begin to move onto the next series of essential oil crops for Rwanda.

Ikirezi Natural Products, and World relief have been recognized at 2 recent events. A speech by Henrietta Fore, the USAID Administrator in November 7th, 2008, and the 2008 White House Final Report titled : "Innovations in Compassion." While World Relief and Ikirezi are highlighted, it was PFID/NP's technical and NP program that provided the technical advice and expertise that made the project a success.

PFID/NP South Africa (Not visited by team)

ASNAPP pioneered, in 1999, the commercialization of natural products in South Africa with the Agriculture Research Council. Newly apartheid free, the government of South Africa and AID/W were eager to initiate small-scale commercial farming to generate jobs and majority owned enterprises in rural areas. Two years later, ASNAPP South Africa moved to Stellenbosch University where it is headquartered today.

PFID/NP has a very focused role *vis-à-vis* the ASNAPP South Africa. Given the historical significance of the commercialization of natural plant products in South Africa, Rutgers University interventions are best employed in other ASNAPP country programs. That said, Rutgers University has made noteworthy contributions in laboratory analysis of rooibos, honeybush and buchu oils and teas. And, the Rutgers University team has submitted professional and scientific publications throughout the U.S. promoting the chemical analytical findings and subsequent health and cosmetic benefits from these South African indigenous plants.

PFID/NP has promoted the same aforementioned South African teas and essential oils in trade shows from California to New York, especially, the International Fancy Food Show, Food Marketing Institute, Institute for Food Technology and the Natural Products EXPO East and West.

PFID/NP has extremely good partnerships in South Africa with private companies as well as with Stellenbosch University. Dr. Simon is a visiting professor at Stellenbosch University's Department of Agronomy.

Acknowledgments

The evaluation team acknowledges the excellent logistics support and responses to questions provided by Dr. James Simon and other investigators at Rutgers University and at the ASNAPP offices in Africa. Thanks also to Katie Yaeger of USDA/FAS for contractual and travel arrangements.

Appendix 1

Guide to PFIDNP Crop Clusters and Introduction to the Natural Plants and Products in which PFID/NP and ASNAPP has Focused (Ver. 1)

Plant butters

Common name	Botanical name	Main uses (for income generation)	Area of production/collection	Illustrative annual production (PFIDNP) in tons*	value of production
Shea butter	*Vitellaria paradoxa*	Shea butter is a fat extracted from the seeds of the shea tree. The butter is rich in fatty acids (oleic and stearic acid) having application in cosmetics and in confectionery and more.	Northern Ghana	-	-
Kombo	*Pycnanthus angolensis*	Kombo butter is the seed fat from a nut that is obtained from the Kombo tree which grows abundant in West Africa. Kombo butter is unique in that it is the only substantial plant source of myristoleic acid, a fatty acid with applications in veterinary products. Newer discoveries have shown the waste from the processing of kombo nuts provides a rich source of anti-inflammatory compounds.	Ghana	11 (6 of nuts, 5 of butter)	50,000

* These values are provided as a reference, and represent values outlined in the past reports

Medicinal and plants with nutritional/food uses

Common name	Botanical name	Main uses (for income generation)	Area of production/collection	Illustrative annual production (PFIDNP) in tons	value of production
Griffonia	*Griffonia simplicifolia*	Griffonia is an important African medicinal plant because the seeds from this tree serve as the source of the bioactive 5-hydroxy-L-tryptophan (5-HTP). This compound, 5 HTP, is used as an antidepressant, to treat serotonin deficiency symptoms and in the treatment of headaches, panic attacks, and weight control.	Ghana	280	1,100,000
Voacanga	*Voacanga africana*	*Voacanga africana* is a small tree or shrub, up to 6 meter high with low widely spreading crown. The seeds are the most economically important part of the plant, containing several alkaloids used for the treatment of Alzheimer's and Parkinson, as well as withdraw symptoms in alcoholics and drug addicts.	Ghana	1,200	5,400,000
Moringa	*Moringa oleifera*	Moringa is a multipurpose tree, also called the miracle tree. The leaves are rich sources of minerals (calcium and iron), vitamins (E and A), and proteins. The dried leaves and powder are used as nutritional supplements and the leaves are also used fresh as a salad green. The seeds are also a source of fats for use in cosmetics and the pressed oil is promising for use in foods and as a carrier oil with cosmetics and essential oils. The immature pods are consumed fresh as vegetable. Seeds are also a rich source of protein with a well balanced amino acid profile.	Zambia, Rwanda, and Senegal	0.5*	32,000
Miracle berry	*Richardella dulcifica*	The fruit, known as miracle berries, produces a glycoprotein having the unusual property to 'convert'	Ghana and other West African	-	-

		a sour and acid taste into an intense sweetness masking the sourness and acidity we would otherwise perceive. This protein is denatured in processing thus the original samples coming to the USA had lost this attribute. As the processing of freezing protects the protein, the pulp of the fruit are now freeze-dried, and the product sold as such often in a ground or powdered form. One such product for example is Miraculin (BioResources International, Inc., one of our PFIDNP private partners). Miracle berry is used as taste-modifier in citrus fruits, vegetables, processed foods, beverages, confectionery and medicines. Efforts are ongoing to have Miracle Berries FDA approved as a dietary supplement ingredient and for use in food and beverages applications.	countries		

*This is for leaf powder; this value is an estimate and is higher since PFIDNP communities in Ghana, Rwanda, and Senegal use Moringa as a vegetable.

The African Mpuntu Brands of Products: Herbal Teas (to demonstrate marketing options but with all products also available as bulk for private packaging and labeling and other uses). This is now trademark protected.

Common name	Botanical name	Main uses (for income generation)	Area of production/collection	Illustrative annual production (PFIDNP) in tons	value of production
Kinkeliba	*Combretum micranthum*	Kinkeliba is a popular infusion in Senegal that is prepared from the dried leaves hand collected from wild indigenous trees. The tea can have a slightly bitter taste and is a very rich source of antioxidants. This is a very popular tea in Senegal.	Senegal	11	175,000
Lippia	*Lippia multiflora*	Lippia is a shrub native to Ghana; the dried leaves are used to make an herbal infusion very popular in Ghana	Ghana	0.5	800

		that is claimed to have digestive, hypotensive, among other properties.			
Lemongrass	*Cymbopogon citratus*	Lemongrass tea, made from the dried leaves of the grass, is a well know infusion in international markets, widely used in traditional medicine. The leaves make a refreshing lemon-like infusion. This grass has been used as antispasmodic, hypotensive, and analgesic, among other uses. The grass is also a source of essential oils.	Zambia	5	9,000
Rooibos	*Aspalathus lineraris*	Rooibos (Family Fabaceae) is a shrub indigenous to the to the Cedarburg and neighboring mountains of the Western Cape Province. Rooibos, also known as red tea, is another popular fermented and dried tea indigenous to South Africa. Now gaining popularity around the world, this local tea has been a long favorite of South Africans with exports beginning in the very late 19th century to Europe from South Africa. In addition to the unique red color and pleasant taste, this herbal tea has been shown to be very healthy, rich in antioxidants and bioactive compounds.	South Africa	420	114,285
Honeybush	*Cyclopia species*	Honeybush is a traditional African tea native to the Western Cape Province in South Africa. The leaves and the flowers showed a characteristic honey scent from which the name Honeybush is derived. The tea is produced from the aerial parts (leaves, flowers and stems) of the shrubs through a process of fermentation and drying.	South Africa	100	42,784
Hibiscus	*Hibiscus sabdariffa*	Hibiscus produced a flower, when mature produces a swollen fruit. The seeds are then removed from the fruit and then dried (know as calyx in commerce). The hibiscus calyx is a popular infusion in Senegal and is	Senegal	56	160,000

		used worldwide in the production of herbal teas blends. Because of its high levels of anthocyanins, hibiscus is also a source of natural colorants.			

The African Mpuntu Brands of products: Spices (to demonstrate marketing options but with all products also available as bulk for private packaging and labeling and other uses). This is now trademark protected.

Common name	Botanical name	Main uses (for income generation)	Area of production/collection	Illustrative annual production (PFIDNP) in tons	value of production
African Birds Eye Chilli	*Capsicum frutescens*	African Birds Eye Chilli produces small red/orange (1 inch/2.5 cm long) very spicy and hot pods. The fruit or pods contain very high levels of capsaicin, the pungent principle of hot pepper. These types of chillies are considered among the most pungent. These chillies also have a beautiful strong color.	Zambia and Malawi	50	130,000
Paprika	*Capsicum annuum*	Paprika produces a 4 inch long pod, is a sweet pepper that is a source of natural colorant for the food industry. Paprika refers to the actual dried (whole, flaked or ground) pod (without the seeds) which is used as a sweet spice, mostly to give color with a moderate flavor to food.	Zambia and Malawi	195	290,000
Grains of Paradise	*Aframomum melegueta*	Grains of Paradise is a seed spice (belonging to the ginger family) similar to cardamom. The spice was popular in the 1500's, though nowadays is almost forgotten. With a ginger and black pepper combinational taste, and increased interest in new flavors, there is increased interest in this old but new African spice. Now used to flavor foods and alcoholic beverages such as beer, extracts are also being developed and commercialized for cosmetic applications.	Ghana	0.3	1,200

Xylopia	*Xylopia aethiopica*	Xylopia is a small tree that produces highly aromatic pods (2 inches/5cm long) rich in essential oils. In Ghana, these pods are dried, ground and used as a spice to flavor a wide array of foods.	Ghana	0.2	600

Essential oils

Common name	**Botanical name**	**Main uses (for income generation)**	**Area of production/collection**	**Illustrative annual production (PFIDNP) in tons**	**value of production**
Geranium	*Pelargonium graveolens*	Geranium is a popular highly aromatic plant well recognized on the international market that contains essential oils (extracted by the process of steam distillation). The geranium essential oils have a rose aroma, and have application in the perfumery industry. The oil of geranium being commercialized in Rwanda is the Bourbon type, considered to be the highest quality for use in the fragrance and cosmetic industry.	Rwanda	0.30	49,500
Eucalyptus	*Eucalyptus globulus*	Eucalyptus is a medicinal and aromatic tree. The leaves are a rich source of essential oils, that contain high levels of the refreshing component, eucalyptol (1, 8-cineole) commonly used in the pharmaceutical and food industry.	Rwanda	-	-

*Further information is available via the New Use Agricultural Natural Plant Products Program (NUANPP) Rutgers University web-site (see papers): aesop.rutgers.edu/~newuseag; and the PFID/NP web-site of this project (www.pfidnp.org) as with our implementing partners in Agri-Business in Sustainable Natural African Plant Products (ASNAPP): www.asnapp.org. This list only features the plants and natural products where we focus the bulk of our attention and thus cannot be considered to represent the vast array of herbal teas, botanicals, medicinal plants, and plants used for cosmetic and food applications. For further information see the web-sites provided.