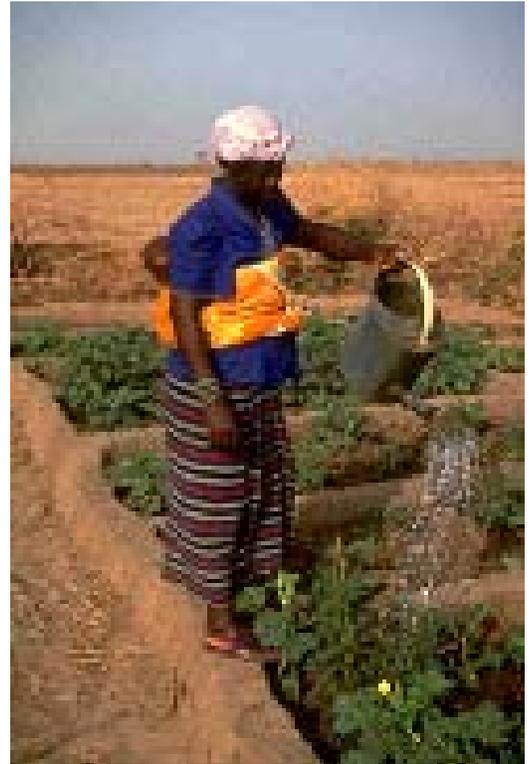
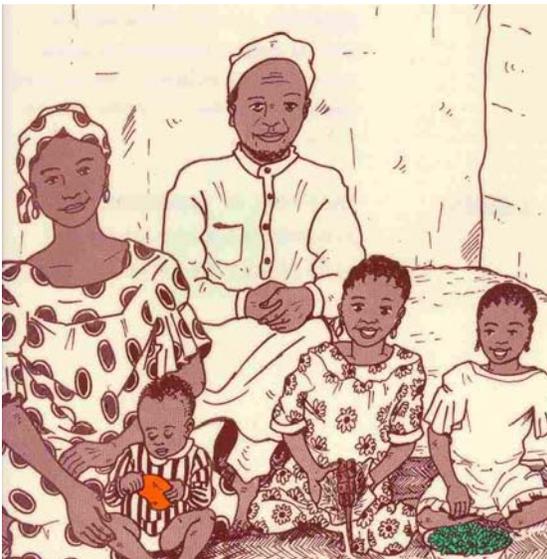




“Vita Burkina”

Improving vitamin A intakes of women and children through production and consumption of orange-fleshed sweet potatoes in Burkina Faso



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Acronyms, Abbreviations and Special Terms

APRG	Association for Rural Support and Promotion of Gulmu
BCC	Behavior Change Communication
Biofortification	Breeding and dissemination of crops with increased micronutrient content and/or availability
CGIAR	Consultative Group on International Agricultural Research
CIAT	International Center for Tropical Agriculture
CIP	International Potato Center
CRREA	Regional Environmental and Agricultural Research Centers
FAO	United Nations Food and Agricultural Organization
GNP	Gross National Product
HarvestPlus	A global initiative to support biofortification
HKI	Helen Keller International
HKI/FFM	Helen Keller International/Food Frequency Method
IEC	Information, Education and Communication
IFPRI	International Food Policy Research Institute
IITA	International Institute for Tropical Agriculture
INERA	Environment and Agricultural Research Institute
IVACG	International Vitamin A Consultative Group
NPAN	National Plan of Action for Nutrition
OFSP	Orange-Fleshed Sweet Potatoes
Sasakawa Global 2000	NGO focusing on the diffusion of improved agricultural technology to small-scale farmers
UNICEF	United Nations Children's Fund
VA	Vitamin A
VAD	Vitamin A Deficiency
WHO	World Health Organization

Introduction

Burkina Faso, with an estimated 2001 population of approximately 11,100,000, remains one of the poorest countries of sub-Saharan Africa. With a GNP of US\$240 in 1999, the economic disparities with neighboring countries persist¹. The scarcity of natural resources, lack of maritime access and harsh climate, all continue to be major economic constraints. Agriculture, by far the leading sector of the economy, is based on food crops (millet, sorghum, corn, fonio and rice) and cash crops (cotton, sesame, shea nut, and peanuts). Secondary crops such as tubers and roots including sweet potatoes, are found in a few regions and play an increasing role in human nutrition. Agriculture is mainly subsistence, subjected to the precarious climate of the Sahel. The chronic food insecurity and limited diet are major contributors to the high levels of protein-energy and micronutrient malnutrition in the country.

Burkina Faso is among the 35 countries identified by WHO and FAO as being the most severely affected by vitamin A deficiency (VAD). It is estimated that 26.8% of preschool-age children suffer from sub-clinical vitamin A deficiency². However, Helen Keller International's (HKI) recent re-appraisal of the magnitude of VAD in sub-Saharan Africa has shown that these estimates are almost certainly a 2.2-fold under-estimation.³ This is corroborated by a baseline survey conducted in Sanmatenga Province (10 villages and one town), of average socio-economic level, where low levels of serum retinol (under 0.70µmol/l) were found respectively in 85% of children 12-36 months (n=215) and 64% of mothers (n=215).⁴ Surveys undertaken in some provinces show a prevalence of night blindness in the last pregnancy of mothers of children under five as high as 16%⁵: three times higher than the cut-off point of 5% indicating that VAD is a public health problem in a population. In order to address this situation, Burkina Faso developed a National Plan of Action for Nutrition (NPAN) that includes a number of strategies to control VAD⁶. The most systematic intervention with a national scope is supplementation of children 6 to 59 months with two doses of vitamin A per year, covering at least 70% of this target group⁷. Food-based strategies are a promising strategy to ensure sustainable improvements of vitamin A intakes for the whole population. Within this context, in addition to the vitamin A fortification of edible oils that is already advanced in the process, several food-based pilot experiences were conducted with success but they not yet been taken to national scale. One of the food-based strategies that could potentially improve vitamin A (VA) intake, is the promotion of orange-fleshed sweet potatoes (OFSP – i.e. rich in β-carotene) that have high yields, good pest resistance and high dry-matter content. The focus of this proposal is to address several issues critical to the scale-up of an OFSP strategy in Burkina Faso, that will also inform programs in other Sahelian countries.

¹ World Bank. Health and Poverty in Burkina Faso. Working Documents Series, Report 2004.

² MI/UNICEF/TU. Progress in controlling Vitamin A deficiency. The Micronutrient Initiative, UNICEF, Tulane University. MI. Ottawa, Canada 1998;

³ V Aguayo and SK Baker. Are We Underestimating the Contribution of Vitamin A Deficiency to Child Mortality in Sub-Saharan Africa?. 2003. Submitted.

⁴ N.M. Zagré, H. Deslisle, A. Tarin, F Delpuech. Evolution des apports en vitamine A à la suite de la promotion d'huile de palme rouge chez les enfants et les femmes au Burkina Faso. *Cahiers Santé* 2002 ; 12 : 38-44.

⁵ HKI/UNICEF. Rapport de l'enquête de base du projet jardinage scolaire et communautaire dans la province du Gourma, avril 2001.

A Tarini, M Ag Bendeche. Rapport de l'enquête de base du projet nutrition communautaire HKI/SCP. Rapport HKI, février 2004.

⁶ Ministère de la Santé. Plan National d'Action pour la Nutrition (PNAN). Ouagadougou 2002.

⁷ HKI/Direction de la Nutrition. Les Journées Nationales Micronutriments (JNM). *Bull HKI Burkina* 2004; No 24.

The impacts of micronutrient malnutrition on health, survival and development have become widely recognized. The four classic interventions: food fortification, dietary diversification, supplementation and public health measures, have been augmented with a complementary approach called biofortification. Biofortification is breeding and dissemination of staple crops with increased micronutrient density/availability.

A global initiative, called HarvestPlus, has been founded by the Consultative Group for International Agricultural Research (CGIAR) centers and their partners under the leadership of the International Food Policy Research Institute (IFPRI) and the International Center for Tropical Agriculture (CIAT)⁸. The 'biofortified' crop that is most advanced, and actually being used in field programs is orange-fleshed sweet potatoes. Most of the work on OFSP to date has been done in Eastern and Southern Africa (including with support from the McKnight Foundation), although HKI has had success in introduction of OFSP on a limited scale in West Africa.

This proposed project is focused on Burkina Faso, but will help demonstrate the potential for OFSP and other biofortified crops to contribute to alleviating micronutrient malnutrition in the Sahel. Burkina Faso makes an excellent test case as the agro-climatic conditions are similar to those in the rest of the Sahelian band; there is a national-level commitment to food-based approaches; and cultural practices related to production and consumption are similar to other countries in West Africa.

Background

The sweet potato (*Ipomoea batatas*), originating from Central America and consumed since the pre-historic era, is a plant that has a good faculty of ecological adaptation⁹. It was introduced in Africa by Portuguese explorers¹⁰. The sweet potato grows relatively well in moderately fertile soils, and with moderate precipitations¹¹. In Burkina Faso, sweet potato is grown in fields of millet-sorghum, corn, and manioc, in orchards, and in some valley bottoms. Its production is annually estimated, as for other similar food crops (cow peas, ground nuts and yam), through the regular national agricultural survey. However, this survey focuses on major staple and cash crops and almost certainly under-estimates production of secondary crops. The average national production of sweet potato between 1994 and 2003 is estimated at 20,840 tons per year. The annual rate of increase of production appears higher than that of yam, despite the lack of promotion in extension¹² or research¹³. Sweet potato production is concentrated in the Upper Basin and Center-West Regions, primarily in the Provinces of Kenedougou and Sissili with respectively 3,300 hectares and 1,300 hectares under cultivation. In spite of favorable climatic

⁸ <http://www.harvestplus.org/>.

⁹ L. DEGRAS. La patate douce. Collection le Technicien d'Agriculture ; Editions Maisonneuve et Larose Paris ; 1998.

¹⁰ Michael T. Murray: Sweet potato – the healthy and antidiabetic starch. *Natural Facts Newsletter* 2003 in WWW. vitamin express.com and *J agric Food Chem* 2001; 49 (6) : 2978-81.

¹¹ Ewell P.T. 1990. Sweetpotatoes in the Eastern and Southern Africa . Paper presented at the workshop on sweet potatoes in the food systems of Eastern and Southern Africa, Nairobi, Kenya.

¹² INERA/CMFPT. Relecture du plan stratégique de la recherche sur les cultures maraichères, fruitières et plantes à tubercules au Burkina Faso. Rapport de l'Institut National de l'Environnement et de Recherches Agricoles (IN.E.R.A.), mars 2003.

¹³ CNRST/INERA /CTA. Bilan de 10 années de recherche, 1988-1998. INERA/KIT 2000.

conditions, production in the Eastern Region is limited.¹⁴ However, almost all provinces have pockets of production that are rarely taken into account in the annual evaluation of agricultural production. The analysis of the evolution of sweet potato production shows high inter-annual fluctuations (Table 1). These unexplained fluctuations reinforce the accepted idea in Burkina Faso that there is a large under-estimation of national data on the annual production of sweet potatoes (and other secondary crops) published by the statistics department of the Ministry of Agriculture. The sampling methods used during the evaluation of agriculture campaigns are adapted to the cereal crops grown in all villages and by almost all rural areas, representing 84% of the population. In order to obtain more accurate estimations of the production of tubers and roots, it is important to develop and implement other survey approaches that have not yet been used.

Table 1: EVOLUTION OF TUBERS PRODUCTION FROM 1994 TO 2003
Metric Tons
 (Source : Directorate of Agricultural Statistics, Burkina Faso)

Years	YAM	SWEET POTATO	TOTAL
1 994	36 446	11 263	47 709
1 995	64 042	12 607	76 649
1 996	49 298	2 989	52 287
1997	36 438	16 100	52 538
1 998	45 525	13 618	59 143
1 999	43 000	17 294	60 294
2000	54 965	27 366	82 332
2 001	70 669	41 646	112 315
2 002	25 187	37 001	62 188
2 003	35 487	28 511	63 998
10-year Average		20 840	

The cultivated varieties of sweet potatoes are dominated by the white-fleshed and the pale yellow-fleshed varieties that are very poor in β -carotene¹⁵. The promotion of the production and consumption of the tubers and leaves of OFSP varieties, in Burkina Faso, as in other Sahelian countries, remains a pertinent dietary strategy for a number of reasons. The evolution of sweet potato production over the last 10 years shows a secular increase in area under sweet potato cultivation. The total area under sweet potato cultivation represents only about 41% of the total land suitable for this crop.¹⁶ This indicates significant potential for increasing production of sweet potatoes.

HKI and UNICEF recently undertook a pilot project to introduce three varieties of OFSP (*Caromex*, *Jewel* and *Taining*) in the Province of Gourma.¹⁷ This experience demonstrated that OFSP can be a complementary seasonal source of VA, even in semi-arid and arid regions. Several channels can be used simultaneously to ensure OFSP diffusion in village communities: current producers of white-fleshed sweet potatoes (primarily men); cereal producers (primarily

¹⁴ Ministère de l'Agriculture/ Service de statistiques Agricoles. Résultat de l'enquête permanente agricole : campagne 2001-2002. Rapport Burkina Faso, juin 2002.

¹⁵ JF Scheuring, J Schierle and M Frigg. Orange-fleshed sweet potatoes bring vitamin A to Malians. *Sight and Life Newsletter* 1996; 4: 6-7.

¹⁶ Burkina Faso. Monograph : www.fao.org/Waicent/fao/agricult/aquastat/BUR.HTM

¹⁷ HKI/UNICEF. Projet jardinage de Fada : Les patates douces à chair orange. *Bull HKI Burkina* 2003 ; No 013.

men); school and women's gardening groups.¹⁸ Sweet potato production, similar to cassava production, is usually an income-generating activity. Sales of sweet potatoes in village markets enhance its availability and access to the non-producing population. A study undertaken in 1978 revealed that sweet potato producers marketed 80% to 97% of their production¹⁹. The lack of more recent information on sweet potato production underscores further the need for increased emphasis on this important crop and its place in the markets and consumption habits of West Africa. In the zone of the pilot project, 78% of sweet potato producers cultivated OFSP in 2003: producers who had previously grown white-fleshed varieties averaged 10 mounds of OFSP and those new to sweet potato production averaged 3 mounds.¹⁸ An OFSP mound corresponds to a production of tubers varying from 8 to 10 kg. Sweet potatoes are well accepted as crops. They are usually consumed between main meals either boiled or grilled. They are more frequently consumed by women and children, the groups most at risk of mortality and morbidity due to VAD. They are a non-negligible source of energy and vitamin A during the period of the year when other seasonal sources of vitamin A (mango, fresh green leaves) are not available (October- December) for these two target groups.

Sweet potato leaves are usually consumed in sauces that accompany the main meal of the day. The promotion and estimation of the consumption of potato leaves were not included in the pilot project. The promotion of the consumption of sweet potato leaves merits a particular attention in this proposed project as green leaves represent the only vitamin A-rich food consumed seven days a week in rural households. They are easily integrated into traditional food preparation.

OFSP planting material is in the form of cuttings that can easily be passed from one producer to the other with minimal financial implications when the producers are well organized and supported. Vegetative reproduction also facilitates maintaining integrity of improved varieties as they are disseminated.

The problems most often highlighted by producers that adopted varieties in the pilot are:

- Vulnerability to disease
- Perforation of tubers by insects
- Short conservation period of the tubers, estimated at three months.

This project will take advantage of plant breeding that has already been carried out to produce OFSP varieties that have improved resistance to pests and disease, are better adapted to semi-arid conditions, and have a higher dry matter content. In Latin America, Asia and East Africa, significant progress has been made in the selection of OFSP varieties that combine high β -carotene content with high dry matter content and high yield.²⁰ Several of these varieties are accepted by producers and consumers and have shown good performance in different ecological conditions.²¹ Use of innovative behavior change approaches to increase production and consumption of OFSP has demonstrated improvement in vitamin A intakes of target groups.²²

¹⁸ HKI. Introduction de la patate douce à chair orange dans la province du Gourma : résultats d'une enquête en période de récoltes auprès des producteurs et consommateurs. Rapport HKI Burkina Faso, Janvier 2004

¹⁹ Institut de Recherches Agronomiques Tropicales et de Cultures Vivrières (IRAT). Synthèse études sur les tubercules de Haute-Volta, 1977-79, Rapport, mars 1980.

²⁰ Regina E. Kapinga. Participatory germplasm conservation, management and utilization in East Africa: Progress report february 03-March 04. IPC/McKnight Foundation CCRP East African Regional Sweet potato project. IPC/McKnight Foundation CCRP East African Regional Sweet potato project; april 2004.

²¹ MCHARO M, CAREY E.E. and GICHUKI S.T. Performance of selected sweet potato varieties in Kenya. *African Crop Science Journal* 2001 ; 9 (1) : 59-66.

²² V Hagenimana and Jan Low. Potential of orange-fleshed sweet potatoes for raising vitamin A intake in Africa. *Food and nutrition Bulletin* 2000; 21 (4) : 414-418.

The OFSP experience in East Africa is currently cited as a good model for investing in human resources and in developing technologies that are relatively easy to transfer to communities. It is also considered as a good way of optimizing the links between agriculture and nutrition.²³ This proposed project will seek to capitalize on these experiences from the outset.

It is not anticipated that any unintended negative consequences will arise from the success of this project. Prior difficulties with the introduction of OFSP have been mainly related to their agricultural performance and susceptibility to pests and disease. The field test phase and the ability to draw on a number of varieties of OFSP should avoid these consequences. Our experience in the Province of Gourma in Burkina Faso also highlights a great demand for planting material from villages adjacent to the project village. If such a situation would present itself during project implementation, we would be able to rapidly increase production of OFSP planting material to meet demands of surrounding (non-project) villages.

In order to assess the feasibility of extending the post-harvest conservation period, trials for shade drying of tubers and green leaves will be conducted, contingent on adequate OFSP production. This would potentially extend the duration of the availability of OFSP in a dried form, retaining at least half of initial post-harvest β -carotene content.^{24, 25}

Several food frequency surveys using the HKI/Food Frequency Method (HKI/FFM)²⁶ revealed high frequencies of sweet potato consumption by children in West Africa²⁸. Between 40 and 65% of children 12 to 71 months consumed white-fleshed sweet potatoes in Niger against 18 to 30% for the OFSP varieties²⁸. In the Province of Gourma, where promotion was ensured during the abundance period, OFSP were consumed at least once a week by 85% to 91% of adult women depending on the site, versus 73% to 78% of adult men. These results indicate that women can introduce, with a minimum of support, OFSP in their diet and that of their children when the physical access is ensured.

HKI's Experience in OFSP Promotion in Burkina Faso

As discussed above, in 2001, HKI started promoting OFSP in Burkina Faso on an experimental site testing the adaptability of several varieties, including seven varieties provided by HKI's program in Niger and two local varieties. The varieties from Niger had originally been provided by the International Potato Center (CIP) in Nairobi, and had already undergone field and palatability testing in Niger. At the end of the first year cuttings from all varieties produced were distributed in primary level schools of the 16 villages covered by the project. Samples of the tubers were also collected. The objective of this trial was to identify varieties with high β -carotene content that performed well in local conditions in order to promote them in the general population. The first cuttings were distributed by providing only one variety per school. This made it possible to determine the yield and resistance to insects and diseases of each variety. The harvests were done at a pre-determined period, with supervisors present. Based on yield, resistance to pests and β -carotene content, three varieties were selected to be promoted (tables 2 and 3). The other varieties were not promoted either because their vitamin A content was low or

²³ Charlotte Johnson-Welch. Linking agriculture and nutrition : the human dimension. Report of International Center for research on women, Washington, DC.

²⁴ V.V. Hagenimana, L.M. K'osambo and E.E. Carey. Potentiel of sweet potatoes in reducing vitamin A deficiency in West Africa. CIP programme Report 1997-98.

²⁵ M.T. Ruel and Carol E. Levin. Assessing the potential for food-based strategies to reduce vitamin A and iron deficiencies. A review of recent Evidence. IFPRI, Washington, 2000, Discussion paper 92.

²⁶ Helen Keller International. How to use HKI Food Frequency Method to Assess Community Risk of Vitamin A deficiency. HKI, incorporated 1993.

very variable, or because their yield and resistance to pests was low. Table 2 also demonstrates the high degree of correlation between flesh color and β -carotene content.

Table 2 : Carotene content of different sweet potato varieties, expressed in $\mu\text{g} / 100\text{g}$ edible part

VARIETY	BETA CAROTENE LEVEL *	OTHER CAROTENE LEVEL	TOTAL CAROTENE LEVEL*	COLOR OF FLESH
NARUMINTANG	2348 \pm 210	208 \pm 18	2555 \pm 211	Dark Orange
CAROMEX	2045 \pm 1192	286 \pm 116	2332 \pm 1198	Dark Orange
JEWEL	1911 \pm 148	199 \pm 11	2110 \pm 148	Dark Orange
TAINING 64	774 \pm 357	31 \pm 5	805 \pm 357	Yellow-Orange
KARMA	429 \pm 525	130 \pm 5	559 \pm 325	Yellow-Orange
LANTAOO BF	170 \pm 50	83 \pm 26	253 \pm 56	Yellow
CN 1442-59	95 \pm 84	27 \pm 1.6	122 \pm 85	Yellow-Orange
LANTAOGO 2	38 \pm 8	3.17 \pm 2	41 \pm 8	Pale Yellow
MING-SHU	6.7 \pm 1.6	33 \pm 2	40 \pm 3	Pale Yellow

* Average \pm standard deviation

Table 3: Yield (ton/ha) of different sweet potato varieties

VARIETY	YIELD (Ton /ha)	COLOR OF FLESH
NARUMINTANG	1.8 \pm 0.0	Dark Orange
CAROMEX	19.6 \pm 11.3	Dark Orange
JEWEL	20.3 \pm 18.4	Dark Orange
TAINING 64	29.4 \pm 6.4	Yellow-Orange
KARMA	20.6 \pm 12.7	Yellow-Orange
CN 1442-59	18.7 \pm 14.9	Yellow-Orange
MING-SHU	14.5 \pm 5.7	Pale Yellow

The participatory strategy for distributing these three varieties rests on several channels (schools, white potato producers and women's groups). In every project village, there is usually at least one women's group involved in gardening. The group is composed of 30 to 35 women volunteers from the same village. Their participation is ensured by village animators chosen by the communities in each village, and trained by the project. After its creation, the group is registered in the nearest administrative service, which gives it an official recognition providing advantages including the opening of a savings' account.

For each of the 16 project villages, cuttings are distributed to develop nurseries to reproduce planting material; nurseries covered five planting beds of 10 m² each (about 1,000 to 1,500 cuttings). Organic fertilizers are suggested. The village nursery is generally set-up in the school, where each producer will come to receive a supply depending on the number of mounds to cultivate. During this process the women's groups are assisted by village animators, and the other producers are assisted by agricultural extension workers and the project coordinator. This participatory approach involves negotiating with the communities and making them responsible for set-up and maintenance of the nurseries to ensure the distribution of cuttings within every village.

This participatory process of distributing OFSP planting material in schools and communities has been ongoing for three years, with two agricultural campaigns. It currently continues and has been integrated in school and community gardening activities. The project includes 16 schools, 16 women's groups and in 10 villages, farmers who have traditionally grown white-fleshed sweet potatoes. In the 16 project communities, OFSP production has evolved from nil in 2000/2001; to 10.7 tons during the 2002/03 season to 16 tons in 2003/04. For traditional sweet potato farmers, 52% have less than 10 mounds planted in OFSP; versus 78% for women's groups and school children.

During their period of availability, OFSP are sold boiled on local markets and villages (25 CFA F/tuber and 500 CFA F/heap of approximately 3 kg of raw tubers). These sales at relatively affordable prices expands access (and therefore benefits) of OFSP beyond producers to include the majority of families in the communities. The practice of sweet potato consumption in the area is similar to that of manioc. They are perceived as snacks and are generally consumed between family meals or to replace a skipped meal.

This experience was the object of several reports and posters, including one at the 2003 International Vitamin A Consultative Group (IVACG) meeting in Marrakech (Morocco) and two additional abstracts that have been accepted for presentation at the IVACG meeting in 2004 in Peru.

Project Goal

Increase production and consumption of OFSP with high yields and high dry matter in two regions of Burkina Faso (Sissili and Eastern Region) and inform OFSP programs in the rest of West Africa.

Project Objectives

- Develop and implement a model for more accurate assessment of the production and consumption of sweet potatoes in collaboration with the national agricultural statistics division
- Introduce, disseminate and evaluate the uptake of new high-yielding, high dry matter OFSP varieties through four target groups (traditional sweet potato producers, cereal producers, women's gardening groups and school gardening groups)

- Promote the production and consumption of OFSP and sweet potato leaves through advocacy and nutrition education at the national and local levels
- Test the feasibility of shade drying of OFSP in collaboration with selected women's groups and local non-governmental organizations (NGOs)
- Enhance the capacity of local agricultural extension agents and other local actors to use participatory methods in the promotion, monitoring and evaluation of OFSP programs

Underlying Research Questions

The project will address nine underlying research questions:

1. Does the current methodology of estimating sweet potato production in Burkina Faso under- or over-estimate production?
2. Will traditional producers of sweet producers substitute the new OFSP varieties for their existing white-fleshed varieties?
3. Will introduction and promotion of new OFSP varieties lead to the uptake of OFSP production by groups that have not traditionally grown sweet potatoes (cereal producers, women's groups, school gardening groups)?
4. Can the introduction and promotion of new OFSP varieties lead to an overall increase in sweet potato production?
5. Does the introduction and promotion of new OFSP varieties lead to an increase in OFSP consumption among women and children in production and non-production families?
6. Is shade drying a viable option for prolonging the post-harvest conservation period of OFSP while maintaining a viable β -carotene content?
7. Do producers select different varieties for tuber consumption and others for leaf consumption?
8. What are the characteristics of OFSP that are valued by producers and by consumers?
9. Can village nurseries provide a sustainable source of OFSP cuttings adequate to meet local demand?

As discussed in the introduction, there is anecdotal evidence that suggests that the current methodology to assess production levels of sweet potato are inadequate. There is not currently a methodology in use to assess consumption. HKI has used the HKI/FFM to provide semi-quantitative estimates of consumption (of white-fleshed and OF varieties).

Our experience in Burkina Faso to date has indicated that traditional producers of sweet potatoes (white-fleshed) are very receptive to OFSP, however, contrary to expectations, they tend to increase overall area under sweet potato production to add OFSP varieties, not to replace white-fleshed varieties with OFSP varieties. This may be due to the OFSP varieties that have been

used to date, and it is important to see if introduction of new high-yielding high dry matter OFSP varieties leads to replacement. Factors that favor replacement and expansion of overall production levels will be identified.

As discussed above, there is agronomic potential to expand sweet potato production beyond current levels. Sweet potatoes have not been the focus of agricultural extension activities. Three groups that have not traditionally grown sweet potatoes (cereal producers, women's groups and school gardening groups) have been identified as adopters of OFSP. Factors that favor their uptake of OFSP production will be identified.

In other OFSP programs, the main objective has been to replace existing varieties with OFSP varieties. As sweet potatoes have never been the focus of extension services in Burkina Faso (or the rest of West Africa), and there is agronomic potential to increase production, there is an expectation that a OFSP-focused promotion program will not just lead to replacement, but also to increased demand for and production of sweet potatoes overall. This is important, because if successful, promotion of OFSP would have impacts not only on vitamin A intake, but also on overall food security.

Often crops that are viewed as secondary to main subsistence crops are marketed rather than consumed by the cultivators and their families. As outlined in the detailed project plan, a comprehensive nutrition education campaign will be carried out targeting improved knowledge of the control of vitamin A deficiency and increasing behavior change by way of increased consumption of vitamin A-rich foods and OFSP tubers and leaves in particular. Ongoing evaluation of the impact of the education campaign will ensure refinement of messages and a baseline and final evaluation will be conducted.

Producers in the pilot area of the program listed the limited post-harvest conservation period of the potatoes as one of their most pressing concerns. The improved varieties of OFSP may begin 2-3 months after planting and may continue from 5 to 7 months.²⁷ Extending this period of availability through preservation techniques such as shade drying could significantly extend the period that sweet potatoes are available to consumers. Experimenting with shade drying viability that guards the β -carotene content of the tubers will be explored with women's groups and local NGOs as the volume of the harvest allows.

Sweet potato leaves are an important component of sauces in Burkina Faso and throughout West Africa. OFSP varieties with desirable tuber characteristics may not have desirable leaf characteristics. Varietal selection will look at both tuber and leaf characteristics, and potentially extension and promotion will focus on some varieties for tubers and some varieties for leaves.

The overall goal of increased intake of vitamin A through increased consumption of OFSP varieties requires increased production and consumption by producers, but also increased acquisition and consumption by non-producers. Characteristics favored by producers may not be the same as those favored by producers (noting that there is much overlap between these two groups). Identifying the characteristics favored by these groups, and their regional variations, will enhance varietal selection to ensure increased production and increased demand and consumption.

²⁷ Low J, Walker T and Hijmans R. The potential impact of orange-fleshed sweetpotatoes on vitamin A intake in Sub-Saharan Africa. Paper presented at regional workshop on food-based approaches to human nutritional deficiencies. The VITAA Project. 9-11 May; Nairobi, Kenya.

The participation of producers in village nurseries will ensure the long-term sustainability and continued expansion of OFSP production after the end of the proposed project. The level of demand necessary to render local nurseries a successful means of ensuring a continued source of planting material will be assessed along with the economic viability of such an endeavor.

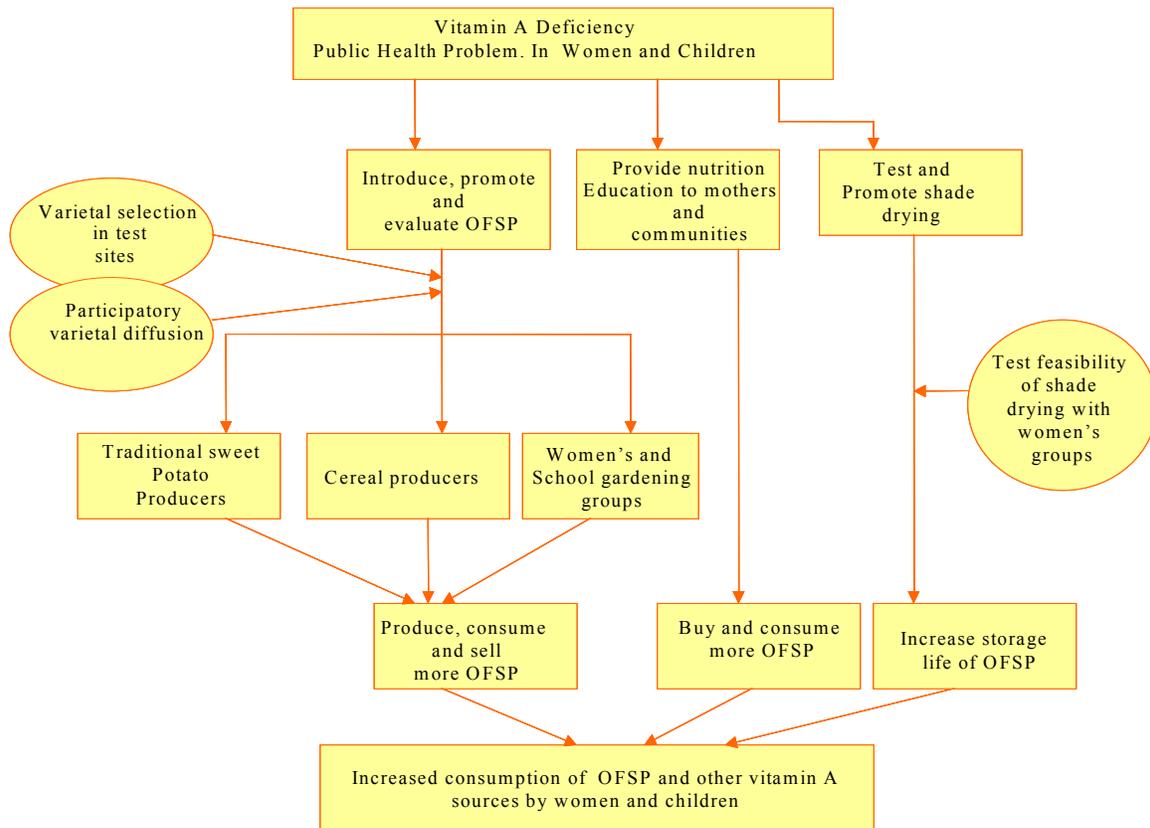
Implementation Strategy

The project has two components (extension and operational research). The research component has the objective of reinforcing the implementation of the extension and distribution of selected varieties in order to inform the process of going to scale in Burkina Faso, and in other countries in West Africa. It will rest on a participatory approach involving as main actors producers at all stages of implementation including monitoring and evaluation. The participation of their representatives in the project start-up workshop, expanded to include participants from East Africa, will allow them to get involved in the conception phase of the project and to participate in the definition of the main implementation steps.

The project implementation strategy is summarized in diagram 1. It rests on the introduction of selected varieties of OFSP orange-fleshed potatoes with producers and consumers associated in the selection of varieties that have valued agronomic and organoleptic characteristics. The project will put a strong focus on participatory community education programs, based on HKI's very successful program experience. This will focus on increasing consumption of OFSP and other vitamin A-rich foods. As illustrated in the diagram, there will also be a trial of shade drying of OFSP tubers as well as leaves, to assess the feasibility of this approach to extend the period of time during which OFSP products are available. These drying techniques have proven their effectiveness in other countries.²⁸

²⁸ G Mulokozi, L Mselle, J Mugyabuso et al. Reducing subclinical vitamin A deficiency through women's adaptation of appropriate technologies in Tanzania. *Food and Nutrition Bulletin* 2001, 22 (4) : 400 – 407.

Diagram 1: Project implementation strategy



Intervention Zone

The project will be implemented in two Regions (Sissili and the Eastern Region). Sissili is among the regions with a high level of production of white-fleshed sweet potatoes whereas the Eastern Region currently has low production of sweet potato with less than 70 hectares under cultivation. However, the region has agronomic conditions that are favorable to sweet potato cultivation and is where the pilot phase of OFSP promotion, discussed above, has been carried out. The OFSP program in the region is a component of a larger school and community gardening project funded by UNICEF through HKI.²⁹ The map below highlights the intervention zones of the proposed project.

²⁹ Z Sifri, M Ag Bendeche and SK Baker. School health programmes in Burkina Faso: the Helen Keller International experience. *Food, Nutrition and Agriculture* 2003 No 33.



VitA Burkina Intervention Zones



Project beneficiaries

The proposed project will cover three provinces of the Eastern Region (Gourma, Komandjari and Gnagna) and one province of the Sissili Region (Koudougou), totaling a population of approximately 840,000 people.³⁰ This includes approximately 315,840 women of reproductive age and 138,600 children ages 12 to 59 months. The project's **direct beneficiaries** will be **51,140** women of reproductive age and **22,440** children 12 to 59 months from 70 villages (50 villages in the Eastern Region and 20 villages in Sissili). The total population is estimated at **136,000 people**. These estimates of direct beneficiaries will be refined following the baseline survey when the final choice of villages will be made. In the Eastern Region, the proposed project will cover all the OFSP promotion activities in 10 villages and the extension of nutrition education activities in the remaining 40 villages. The distribution of planting material in these latter 40 villages will be funded by the HKI-UNICEF gardening project in the Province of Gourma. A proposal for an integrated three-year project of gardening and trachoma prevention in the Province of Komandjari³¹ was funded in July 2004 by the Taiwanese Department of Health through the Embassy of the Republic of China in Burkina Faso. For the 20 villages of Sissili, all activities will be funded by this proposed project to the McKnight Foundation.

The project's indirect beneficiaries will be represented by the populations of villages not included in the project, who regularly visit the same local markets used by sweet potato vendors from the intervention villages. This will therefore include all villages within a 10 km radius around a small market used by OFSP vendors from the project villages or those within a 15km radius around a large market. Depending on their size, approximately 7 to 12 villages usually

³⁰ Ministère de la Santé/DEP. Annuaire statistique/Santé, Rapport 2000.

³¹ HKI. Projet intégré de jardinage et de lutte contre le trachome dans la province de Komandjari : renforcement des liens entre école et communauté. Projet financé par la coopération taiwanaise à travers l'ambassade de Chine en juillet 2004.

use the same market. The baseline survey will provide more accurate information on the organization and use of local markets by villages. It is on this basis that it will be possible to estimate the number of indirect beneficiaries of this project. Schools being a distribution channel for OFSP, school children and primary level teachers in the project zone will also be considered as indirect beneficiaries.

In each project village, the actors will include at least one women's group, two animators, at least 10 farmers who already produce sweet potatoes (white-fleshed varieties) and at least 10 farmers who produce cereal (millet, sorghum, maize). In villages where there are schools, the will also be used as dissemination channels for both OFSP planting material and nutrition education messages and school gardening groups will be included.

Implementation process

The proposal is for a four-year project with the following main activities:

During the first year of the project, the following main activities will be undertaken:

- Continue the project activities for the promotion of OFSP in the Province of Gourma. It will consist of continuing to diffuse the cultivation of the three selected varieties, while doubling the number of producers and expanding the production to women's groups. This activity will benefit from financial support from UNICEF in 2004.
- Organize an exchange workshop with teams (researchers, producers and NGOs) specialized in research and promotion of varieties of OFSP in East Africa. The outcome of this workshop will be a list of new varieties of β -carotene rich potatoes, with high yield and a high dry matter content. All the information available on these varieties will be collected. This workshop will also help to capitalize on lessons learned in varietal selection, extension, the success of multiple partnerships involving producers, nutrition education, monitoring and evaluation and on the use of virus detection kits for sweet potatoes (sensitivity, specificity and conditions of use). Workshop recommendations will be considered in the annual project activities planning process.
- Cuttings of the new OFSP varieties will be sent to Burkina Faso for the first phase of tests and observation on the experimental sites in Fada and Sissili. The Fada site is already set-up and in use. Several women's groups supported by village animators are also already operating there. However, since the Sissili site is new, we will collaborate with the Environment and Agricultural Research Institute (INERA) for setting-up and implementation. The INERA has a research station in this zone in Saria.
- Develop and apply a more specific methodology for evaluation of the annual production of sweet potato, including OFSP. This method will be developed by HKI with the technical support of the agricultural statistics service. Its application will lead to estimates, as precise as they can be, for the production of sweet potatoes in the two test regions. The estimates obtained will then be compared to those of the regular evaluation by the agricultural statistics services. The lessons learned by this approach will be used by the agricultural statistics services to improve the usual methods or to define correction coefficients for national data.
- Ensure advocacy at the national, regional and local levels to ensure the project is known and to create awareness on improvements in food security and reductions in vitamin A deficiency.

- Undertake a baseline survey (to be repeated at the end of the project) in the two regions (20 villages per region of which 10 are control villages) on:
 - o Sweet potato production (competencies, practices and preference criteria/cultural acceptability, quantity, farmers' demand, management of insect attacks and viral diseases, capacity to disseminate technologies, and final destination of the production.)
 - o The consumption of vitamin A-rich foods, including tubers and sweet potato leaves by using HKI/FFM.
 - o Knowledge and perception of the nutrition and symbolic value of OFSP and its place in the collective family dish and the individual consumption between meals.
 - o The preferences (preference criteria recognized for women) and different modes of preparation and of consumption of different parts of the potato (tubers and leaves)
 - o The distribution chain including local markets
 - o The traditional vegetable drying methods and information on sweet potato if available.
 - o The prevalence of night blindness in mothers of children under 5 during the last pregnancy.

The decision to use increased OFSP consumption as a proxy for increase serum retinol is based on work done in Kenya that showed increased consumption of red-fleshed sweet potatoes increased the serum retinol in children between 3 and 6 years of age regardless of increased dietary fat and/or concurrent anthelmintic treatment, though these complementary factors had an additive effect.³² The considerable financial costs of adding serum retinol as an outcome indicator is also dissuasive.

During the second year:

- Initial selection of new OFSP varieties on the two test sites based on yield and disease and pest resistance in order to start the process of participatory varietal selection in the two target regions. This initial selection on the test sites from a large pool of clones may eliminate some OFSP varieties that are inappropriate.
- Work with farmers to set up village nurseries in order to produce planting material and then disseminate planting materials to producers in the two project regions. The dissemination process will include: sensitization of farmers on OFSP varieties, training on different aspects of production, harvesting and post-harvest techniques, monitoring and evaluation. The introduction trial will use participatory methods to respond to questions related to producers' and consumer's preferences. The implementation protocol will benefit from the experience of CIP in Indonesia.³³ This approach variety dissemination should result in varieties that respond to producers' and consumers' expectation in terms of yield and organoleptic properties. It is assumed that the bulk of OFSP production will be under rain-fed conditions.

³² Jalal F, Nesheim MC, Agus Z, Sanjur D and Habicht JP. Serum retinol concentrations in children are affected by food sources of β -carotene, fat intake, and anthelmintic drug treatment. *American Journal of Clinical Nutrition* 1998, 68:623-9.

³³ E. Van de Fliert and A.R. Baun. Farmer Field school for integrated crop management of sweetpotato. Fields Guide and Technical Manual. Bogor, Indonesia, 1999. International Potato Center.

- Undertake a collection of samples to study the importance of viral attacks on different varieties of sweet potatoes, selected on-site and by producers for their distribution. Viral attacks are relatively frequent in the Sahel and the demand for virus-resistant varieties is very high in sub-Saharan Africa.⁹ We will use the Virus Diagnostic Kit, which is a simple field tool, not available yet for sale, and that can be obtained by paying the shipping fees
- Prepare the trial of shade drying of OFSP tubers and leaves. This trial will be implemented in Gourma Province with the collaboration of the Association for Rural Support and Promotion of Gulmu (APRG), by using its large network of village group. Burkina Faso has a long experience in drying of fruits and vegetables in general, and mango drying in particular, using improved and affordable solar drying methods. A potential market exists, particularly in urban settings but with some potential also in rural settings. Dried products that meet quality and package norms are often sold in urban supermarkets. Dried fruits and vegetables can be an important source of income for producers. This trial will initially target family members of producers and schools. Schools represent a good entry point for the promotion of the consumption of these products in the community. APRG has solid experience in this field and in supporting farmers' organizations. HKI and APRG will jointly develop assessment protocol.
- Develop and implement a communication strategy, adapted to improve the knowledge of communities on the nutritional advantages of OFSP and the nutritional needs of vulnerable groups for controlling vitamin A deficiency. This strategy will also aim to target the systematic adoption of new varieties of OFSP and of new food habits integrating the consumption of OFSP tubers and sweet potato leaves. Results of the baseline survey will help identify needs, interests of populations and obstacles. Several communication methods will be used. The project will use the existing nutrition education system in the context of the school and community gardening project. This system has been developed by nutrition, agriculture, and communication specialists, as well as village animators as representatives of the community. It is focused on training and using village animators to promote the production and consumption of vitamin A-rich vegetables. After training the animators, who are themselves producers, use a flip-chart developed by the project to organize regular discussions-debates with women's groups or during home visits. Their actions are reinforced by those of agriculture extension workers who are government agents responsible for providing support to five to ten villages. A flip-chart will be developed on the promotion of the production and consumption from a data bank of messages developed during a workshop grouping communication specialists, extension workers, producers, animators, local representatives of agriculture services, teachers and the HKI team. HKI's experience with flip-charts has shown them to be an effective communication tool, well understood by the communities and appreciated by the village animators and teachers. The animators will also undertake cooking demonstrations with dishes using OFSP tubers and sweet potato leaves during weekly markets or fairs. Mass media, particularly regional radios, will be used to support community action by airing radio spots and programs before, during and after the winter campaign of sweet potato production. Schools will be used to transmit messages through songs and theater. This nutrition education approach is an adaptation of HKI experiences in Asia on home gardens³⁴⁻³⁵ and other research

³⁴ A. Talukder, H. Tortellesse, S de Pee et al. Integration of animal Husbandry into home gardening programs to increase vitamin a intake from foods. Communication, IVACG 2003, Marakech (Marocco).

structures,³⁶ and HKI's extensive experience in nutrition and public health communication in Africa.

During the third year

- Ensure the dissemination at a larger scale in the project zone, of planting materials of varieties of OFSP selected for promotion. Identify, train and assure follow-up of farmers producing planting material in the villages.
- Continue implementation of the communication strategy with the aim to promote a better frequency of consumption of OFSP by women and young children in households.
- Conduct the annual production evaluation survey
- Continue implementing and documenting the OFSP drying trial
- Conduct the different qualitative research and studies on sweet potato diseases (using the virus detection Kit). The different research protocols will be developed and implemented with the support of INERA researchers, by referring to the literature and references proposed by McKnight Foundation reviewers at the time of submission of the first version of the proposal, and by referring to HKI's own experience.³⁷

During the fourth year

- Continue implementation of the communication strategy with the aim to increase frequency of consumption of OFSP by women and young children in households.
- Strengthen extension visits to nursery holders (producers of planting material) and the different OFSP producer groups
- Identify existing partners involved in agricultural programs in Burkina Faso that could integrate OFSP into their programs and therefore extend the reach of the experience. Potential partners, with which HKI already has a working relationship are Africare, Sasakawa Global 2000, FAO and a number of local NGOs.
- Evaluate the different project components, including the evaluation of the annual sweet potato production season.
- Document and disseminate project results and work with local partners to develop a plan to scale up OFSP production in Burkina Faso.

Project partners

Helen Keller International

Helen Keller International (HKI), lead implementing agency for the proposed project, is a non-governmental organization with a mission to save the sight and lives of the most vulnerable and disadvantaged. Its main programs worldwide are eye health (onchocerciasis, trachoma, cataract) and nutrition (vitamin A deficiency, other micronutrient deficiencies, promotion and support of exclusive breastfeeding and optimal complementary feeding practices, promotion of food-based

³⁵ A Talukder et al. Increasing the production and consumption of vitamin A-rich fruits and vegetable: Lessons learned in taking Bangladesh homestead gardening programme to a national scale. *Food and nutrition Bulletin* 2000, 21 : 165-172.

³⁶ Attig, G.A., S Smitasiri et al. Promoting home gardening to control vitamin A deficiency in northeastern Thailand. *Food and Nutrition Bulletin* 1993, 7 : 18-25.

³⁷ Blum L., P.J. Pelto et al. Community assessment of natural food sources of vitamin A : Guidelines for an ethnographic protocol. Boston, MA and Ottawa, Canada, International Nutrition Foundation for developing countries (INFDC) and IDRC 1997. Diène SM. Use participatory approach to design, implement and evaluate a sustainable community-based nutrition education delivery system in Fatick region of Senegal. Ithaca, NY, Cornell University 1995.

nutrition interventions). HKI is a technical assistance NGO focused on reinforcing the capacities of partners in the goal of obtaining significant impacts in national program implementation. It ensures advocacy to support policies and programs at the national, regional, and international levels.

HKI Africa has a long experience in the conception and implementation of community education programs in nutrition and eye health. We have developed a number of techniques from community-based personal counseling to traditional theater groups to rural radios.

HKI has established itself as a leader in Africa in the control of micronutrient malnutrition, including supplementation, food fortification and other food-based approaches. HKI started introducing OFSP to Niger in 1997³⁸ and in Burkina Faso since 2000. is recognized as one of the most advanced organizations in the prevention of nutritional deficiencies, particularly vitamin A deficiency. In Mozambique, HKI works extensively with CIP, IITA, Michigan State University, the Mozambique Agricultural Research Institute and other NGOs to promote production and consumption of OFSP. The acquired experience in the combined implementation of several vitamin A deficiency control strategies, including food-based strategies and the presence of HKI national offices in many countries, reinforce our credibility in the sub-region. HKI seeks to work through partnerships to effect systemic change in order to ensure improved nutrition and eye health of vulnerable populations.

HKI seeks to recruit highly-qualified technical staff in country and regional offices, in order to ensure adequate technical support at the field level. The Regional Office for Africa, based in Dakar, will take the lead in providing technical support and follow-up to this project, including validation of research protocols. Dr. Mohamed Ag Bendeche, West Africa Nutrition and Child Survival Advisor, the principal author of this proposal and formerly country director in Burkina Faso, will coordinate the regional office's support. He will be assisted by Dr. Serigne Mbaye Diène, West Africa Regional Nutrition Advisor and supervised by Mr. Shawn K. Baker, Regional Director.

The Burkina Faso team includes experienced professionals in public health nutrition, behavior change communication/information, education and communication and agronomy. The project will be under the direction of Ms. Rachel Hampshire, country Director for Burkina Faso. In addition to the office in Ouagadougou, HKI has a sub-office in Fada N'Gourma, staffed by an agronomist and a training specialist who are currently implementing school- and community-based gardening and trachoma control projects, including promotion of OFSP. This ensures close day-to-day follow-up of project activities.

UNICEF

UNICEF and HKI collaborate closely on a number of nutrition programs in Burkina Faso, and UNICEF is funding the current phase of the school and community gardening project, including the promotion of OFSP, in the Eastern Region. The project contributes to increasing the consumption of several vitamin A-rich foods and the increase in women's knowledge on vitamin A deficiency and its links to diet. The UNICEF support will continue for at least the first year of the new project. The UNICEF contact person for this proposal is Dr. Luula Mariano (lmariano@unicef.org), head of health and nutrition programs.

³⁸ Y Mounkaila and SK Baker. Identifying appropriate vitamin A-rich sweet potatoes for Niger. Communication, IVACG 2001.

Agricultural Statistics Service, Ministry of Agriculture

The Agricultural Statistics Service is the principal producer of agricultural data in Burkina Faso. It publishes the results of the regular agricultural survey (EPA) on an annual basis. The main purpose of the EPA is to estimate annual production levels. It is a key decision making tool focused on providing yearly cereal crop production estimates per province during the month of October. It also provides estimates of other agricultural products.

This service will be the key partner for development and testing of a new evaluation methodology to improve accuracy of estimates of sweet potato production. If this tool is accepted at the national level, it will be the principal implementer. The Agricultural Statistics Service is based in Ouagadougou and the contact person for this project will be the Director, Mr Mahama Zoungrana (mazoung@netaccess.bf). Their web-site is: www.agristat.bf.tripod.com.

Environment and Agricultural Research Institute (INERA)

INERA is a national environmental and agricultural research institute with five regional centers (CRREA):

1. CRREA East, based in Fada N’Gourma covering Eastern and Center-Eastern Regions
2. CRREA Center, based in Saria
3. CRREA West, based in Farakoba
4. CRREA North-West, based in Di
5. CRREA Sahel based in Dori

Each CRREA covers a number of research activities specific to its intervention areas and has a research station where trials are conducted. CRREA West also has a research station in Banfora where trials of fruit trees are conducted, and a research station in Niangologo where trials on legumes are conducted, in addition to the main station in Farakoba. The contact person at INERA in Ouagadougou is Mr. Jérôme Belem, Head of Root and Tuber Crops, INERA, 04 BP 8645 Ouagadougou 04 Burkina Faso, Tel: 226 50 34 02 70, Fax 226 50 34 02 71.

Association for Rural Support and Promotion of Gulmu (APRG)

APRG is a local NGO created in 1978 that supports the socio-economic development of villages in the Eastern region. It has helped establish and supports 250 village groups. These groups include 7,000 members (of which 4,000 are women) and include the main ethnic groups (Gourmantché, Mossi and Peulh). The groups are all in rural settings where health, education, water, nutrition and transport issues present a constant challenge. The current activities of APRG are:

- Training for reinforcement of capacities of producers’ organizations;
- Protection of the environment through the implementation of anti-erosion interventions;
- The promotion of women and their participation in development activities and in setting up income generating activities;
- Savings and loans associations;
- Increasing access to water.

In addition to the sweet potato drying trial, the network of village groupings, supported by APRG will be used for the distribution of new varieties of OFSP after their selection for

promotion. The headquarters of the APRG is based in Fada N’Gourma, BP 72, Tel : 226 40 77 00 81, with the contact person for this project is the interim Director, Mr. Djibrilla Maïga (aprg@fasonet.bf).

Budget Narrative

Division of contributions

In Gourma Province, the proposed budget will include the contribution of the HKI and UNICEF gardening projects that will be ongoing until 2005. The HKI/UNICEF project covers 20 villages. In addition to salaries, this contribution will support distribution activities, and monitoring and evaluation of OFSP promotion activities in these villages in 2004 and 2005. The McKnight contribution will cover aspects pertaining to the functioning of the experimental site, the baseline surveys, IEC activities, research and the sweet potato drying trials.

In the Province of Komandjari, if the funding from the integrated Taiwanese gardening and trachoma prevention project is obtained, it will provide over three years, in 20 villages, contributions identical to those of the Gourma gardening project.

In the 20 villages **of the Province of Sissili** and **10 in the Province of Gnagna** will be entirely covered by the McKnight project, as no other projects exist to date in this area.

Contribution of the Regional Nutrition Advisor

The Regional Nutrition Advisor, based in Dakar, will provide a regular technical assistance to the project, especially in the preparation of the baseline survey and in the documentation to answer to the research questions. The work volume will be the same during the three years. HKI will contribute to 5% of the salary of the Regional nutrition Advisor during the second year of the project. There will be at least one trip to Burkina Faso. The activities of the Regional Advisor will be supported by those of the Regional Director and will supervise the project as part of his regular activities.

Regional exchange workshop with participants from East Africa

This three-day regional workshop will be organized in Ouagadougou, and will group HKI participants (regional office and national offices of Burkina Faso, Mali, Niger and Nigeria) and participants in sweet potato projects (McKnight, CIP Kenya et Uganda, VITAA and ITTA).

Annual budget planning

At the beginning of each project year, a detailed program budget will be developed and will serve as a basis for implementing the activities in the field.

Categories	Year 1	Year 2	Year 3	Year 4	TOTAL McKnight contribution	Total HKI contribution
1. HKI Staff						
HKI Regional Director (5% yr 1, 0% yr 2, 0% yr3, 0%year4)	4,000	0	0	0	4,000	0
HKI Agronomist (25% McKnight; 75%HKI)	2,500	2,600	2,704	2,812	10,616	31,412
Regional nutrition advisor (5% yr1; 5% yr 3; 5% yr 4 McKnight; 5% yr2 HKI)	2,550	0	2,650	2,756	7,956	2,600
HKI Burkina Country Representative (5% yr 1, 5% yr 2, 5% yr 3, 5%year 4)	2,000	2,080	2,163	2, 250	8,493	24,929
HKI Burkina Support Staff (5%)	1,800	1,872	1,947	2, 025	7,644	0
Sub-Total HKI Staff	12,850	6,552	9,464	9,843	38,709	58,941
2. Consultants						
National consultant specialized in agricultural statistics (survey) (2 missions of 15 days)	1,394	0	1,400	0	2,794	0
Sub-Total Consultants	1,394	0	1,400	0	2,794	0
3. Regional Travel						
1 plane ticket for Regional Nutrition Advisor	700	0	750	0	1,450	0
Lodging Regional Nutrition Advisor (7nights)	390	0	400	0	790	0
Per diem Regional Nutrition Advisor	383	0	410	0	793	0
Sub-Total Regional Travel	1,473	0	1,560	0	3,033	0
4. Field Activities						
Baseline and Endline Surveys and Evaluation for annual OFSP production	3,500	0	1,500	4, 500	9,500	0
Regional Workshop for Exchange of Experiences	6,000	0	0	0	6,000	0
Onsite testing of sweet potato varieties	1,000	1,500	1,500	0	4,000	2,000
Production and distribution of planting material	0	2,500	3,000	1,000	6,500	5,000
Monitoring and Supervision	1,000	2,000	3,000	0	6,000	9,500
Communication Strategy Development Workshop	1,500	0	0	0	1,500	0
Production and dissemination of nutrition education tools and training of groups	0	4,000	2,500	2, 000	8,500	2,000
Sub-Total Field Activities	13,000	10,000	11,500	7 500	42,000	18,500
5. Orange potato drying trial						
Sub-contract with APRG to implement trials	0	2,500	2,000	1 500	6,000	0
Sub-Total Drying Trial	0	2,500	2,000	1 500	6,000	0
6. Support to research activities						
Support to implementation of research protocols (including use of virus diagnostics kit)	1,500	2,500	2,000	5 000	10,500	0
Contribution to the meeting with the Eastern research teams	2,500	0	0	0	2,500	0
Sub-Total Support to research activities	4,000	2,500	2,000	5 000	13,500	0
7. Evaluation						
Final Evaluation of the process of implementation and dissemination	0	0	0	1, 500	1,500	2,500
Sub-Total Evaluation	0	0	0	1 500	1,500	2,500
Sub-Total (categories 1 to 7)	32,717	21,552	27,924	25,263	107,536	79941
Overhead (10%)	3,272	2,155	2,792	2,526	10,754	0
TOTAL GÉNÉRAL	35,989	23,707	30,716	27,789	118,290	79,941