

PRODUCTIVE SANITATION IN AGUIE NIGER
- TESTING A NUTRIENT RECYCLING SYSTEM
WITH A VIEW TO MEASURE ITS POTENTIAL FOR IMPROVING
AGRICULTURAL PRODUCTIVITY



Grant Title

Testing a Nutrient Recycling System (Productive Sanitation Systems) in Niger with a view to measuring its Potential for Improving Agricultural Productivity

Abstract

Introduction

Productive sanitation is about safe and productive reuse of the nutrients and organic matter in human excreta in agriculture. A pilot project on productive sanitation was carried out in the Aguié province, Niger, during 16 months from Nov. 2008 to Feb. 2010 with main funding from IFAD. CREPA¹ was implementing organization in close collaboration with PPILDA² and SEI³. The overall goal of the project was to improve agricultural productivity to ensure more food security and health for smallholder farmers through PSS (Productive Sanitation Systems).

The specific objectives were:

1. PSS are accepted and have measurable effects on food production in the pilot communities (comparative analysis with other fertilizers or non fertilizers)
2. Other actors in the field of sanitation/agriculture integrate the concepts of PSS in their work and policies

The project was carried out in the Aguié province in southern Niger, in the same intervention zone as PPILDA (Figure 1). Aguié is one of the most densely populated zones in Niger, with a high land pressure and repeatedly stricken by famines.

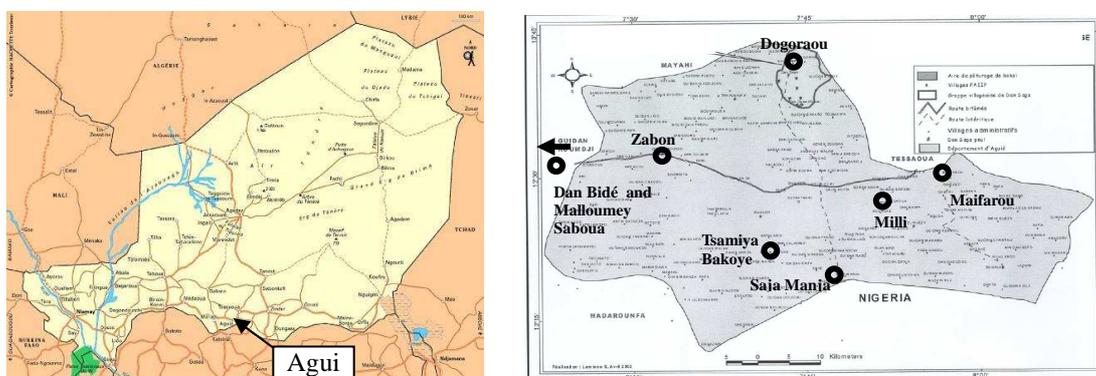


Figure 1. The location of Aguié in southern Niger on the border to Nigeria

The project had three main components:

1. A development component: Introducing and gaining acceptance for productive sanitation in 11 villages in Aguié.
2. A research component: Research on fertilizing effects of urine as well as on risks and low cost technology to facilitate the collection, treatment and reuse of human excreta.
3. A dissemination component: Local, national and international outreach of the results of the

¹ Centre Régional pour l'Eau Potable et l'Assainissement à faible coût

² Projet de Promotion de l'Initiative locale pour le développement à Aguié

³ Stockholm Environment Institute

project.

The outcomes and impacts of the three components are summarized below:

1. Development

- A methodology for introducing sanitized urine and feces as fertilizers was developed, based on participative agriculture tests and also on transferring the understanding of both dangers and resources in human excreta.
- During the course of the project more than 1100 households in eight villages started to collect urine via simple urinals, and 190 households acquired either composting toilets or dry toilets with urine diversion that facilitate the sanitization of feces, for later reuse in agriculture.
- The local cultural barriers were overcome and a mind shift regarding the importance of a conscious management of human excreta could be noted. In a couple of villages, urine has become a commodity, with a farmer from Saja Manja village buying several hundreds of 20-litre jerry cans of urine from other households as the most interesting example.

2. Research

- Theoretical calculations showed that the excreta from a family of nine in Niger contain nitrogen (N) and phosphorous (P) corresponding roughly to 50 kg of NPK and 50 kg of urea each year. In Niger this is worth around 80\$ US depending of course on the current fertilizer price. The majority of these nutrients are excreted via urine and the effect of urine as a fertilizer was equal to or better than urea, for the same amount of nitrogen applied. This is expected as urine also contains certain quantities of P, K, S as well as micronutrients.
- The participative tests of using urine in the field showed that urine gave ~20% higher yields compared to urea on cereals and 40-50% higher yields compared to when only base fertilizer was applied (organic matter).
- In participative evaluations on taste and visual preference, the urine fertilized crops were generally favoured when compared to crops fertilized with urea.
- The sanitary aspects of urine show that no major pathogens could be detected in the urine after 30 days of storage except for clostridium in three out of seven cases examined. However, the infective dose is quite high, and clostridium is frequently present in the intestines of both humans and animals and widely distributed in the environment due to its spore forming ability.
- The research on cost reduction, showed that it could be possible to decrease the toilet subsidy from 45\$ to 25\$ and still have a well functioning toilet. The storage of large volumes of urine during the dry season is difficult, and the options of adding urine to a compost pile/pit or incorporating it into the field even during the dry season can be viable alternatives.

3. Outreach

- Locally the outreach was done by inter-village visits, and also via an open house event in Maifarou village, where 3500 participants attended.
- Representatives from three ministries in Niger and from four IFAD funded projects in Mauritania, Madagascar, Rwanda and Uganda participated in a three day study visit to Aguié. PPILDA and KKM, two large rural development projects in southern Niger, decided to include productive sanitation in their work plan for 2010 following the results of PS-Aguié in 2009.
- Internationally, around 100 participants attended the side event organized by CREPA, SEI and IFAD at the World Water Week in Stockholm.
- Over 305 unique visitors have entered the PS-Aguié website, which has had both a French and an English version. Six films have been compiled and the four films put up on Youtube

- have attracted between 171 and 803 views (Nov 2010).
- Three posters were produced, of which one summarizing the PS-system in both text and illustrations.
 - The project was the subject of a 30 min radio program on RFI (Radio France International), which has good coverage in all of French speaking Africa. It was also covered twice on national television in Niger.

Replicability perspectives (scaling-up/out)

Urine collection and reuse can be technically simple and low cost, while the institutional and cultural aspects are major challenges for scaling up, especially in Muslim contexts where urine is considered as something that should never be touched. However, with sensitization, protective measures and participative tests these obstacles can be overcome. Reuse of human excreta can be seen as a way to improve local nutrient management complementary to soil conservation technologies and the recycling of animal manure and organic matter. The WHO guidelines on the reuse of human excreta from 2006⁴ give a good foundation for risk reduction in the whole chain from collection to reuse, that can be adapted to local climatic, cultural and economic contexts. Risk management is especially important when dealing with human faeces, which is a major source of pathogens in the environment. In comparison to faeces, urine is quite harmless (most often sterile) and contains the majority of the nutrients excreted from the human body.

This means in short:

- Efficient faeces management = greatest impact on health
- Efficient urine management = greatest impact on food production

Based on this fact, the most straightforward strategy would be to promote simple urine collection for productive reuse via the agriculture sector. Urinals can be very low cost, treatment is fast and risks are low. The collection, treatment and safe reuse of faeces requires more knowledge, funds and time, and need to be promoted in concerted efforts between agriculture and sanitation stakeholders. The construction and use of toilets together with hand washing devices protects health. If the toilets are constructed to facilitate treatment and reuse, there is also a good foundation for safe nutrient recycling in agriculture.

In Niger, the productive sanitation approach can grow organically from below via farmers and NGO's. It also suits well into the rural development strategy (SDR), in which it could contribute to the goals of several main programs like capacity development, food security, health and environment. PPILDA is continuing to promote the approach, and has an outreach potential of 260 villages in their target area. More examples on the ground are needed to reach a critical mass of evidence that the government cannot ignore. This should be coupled with more research, awareness raising, capacity building and policy advocacy.

In Burkina Faso, CREPA together with the Ministry of Agriculture is running three larger EU funded projects where productive sanitation and soil/water conservation technologies are combined. If productive sanitation can be seen as an important part of local nutrient management for improved food security, it can probably be up-scaled faster via the more developed agriculture sector than via the sanitation sector, which often is quite weak in West Africa. Sanitation has been a forgotten sector, with low human, financial and institutional capacities, but with a significant importance for

⁴ The WHO guidelines from 2006 on the productive reuse of human excreta and greywater can be found here: http://www.who.int/water_sanitation_health/wastewater/gsuweg4/en/index.html

agricultural production.

Conditions for uptake

Cultural issues and capacity building

Before the project, the concept of productive sanitation was thought to be very challenging to introduce in Niger due to cultural/religious aspects. However, small holder farmers in Niger face a reality of increasing land pressure in which they have no choice but to manage the existing resources in an optimal way. The majority can only afford small quantities of chemical fertilizers and in most cases the management of nutrients/organic matter in human excreta is neglected. At the same time open defecation, inadequate latrines and poor hygiene practices cause 26400 children die annually in Niger from diarrhoea.

On village level it is important to give an understanding of both dangers and resources in human excreta, and how the dangers can be eliminated and the resources captured and reused. In Aguié this was done in a practical way, via SARAR/PHAST tools and participative testing of urine as a liquid fast acting nitrogen fertilizer.

Reinforcing local knowledge and capacity via the methodology developed in the pilot project can be used to spread uptake in the Aguié province. Continued participative testing of urine as a cover fertilizer in more farmer field schools and increased emphasis on inter-village exchange visits would be useful. The information needs to get out into the villages, and local radio coverage as well as a large scale spreading of the PS-poster and the first national urine guideline for Niger would be important.

Important messages for decision makers to consider on nutrients in human excreta

For a wider uptake there are many possible pathways. The use of productive sanitation could grow organically from below or be integrated into national legal frameworks and strategies, either via the sanitation/health or agriculture sector.

For productive sanitation to be integrated into national agriculture and/or sanitation plans, decision makers need to become aware of the value of resources in human excreta. In fact, what we eat is basically what we excrete in terms of plant nutrients, except during growth when a minor part is accumulated in growing body tissue. Every year a West African consumes and excretes roughly 3 kg of N, 0,5 kg of P and 1 kg of K (Figure 2).

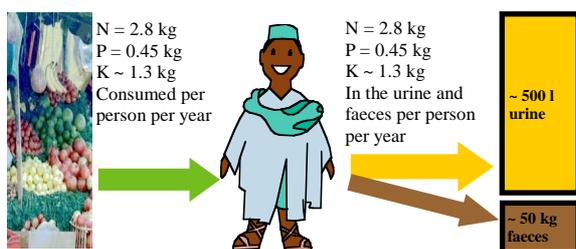


Figure 2. There is equilibrium over the human body – “what we eat is what we excrete”.

It is estimated that the average family in Aguié (9 persons) excretes the equivalent of 50 kg of Urea and 50 kg of NPK (14:23:14) each year, to a value of 80\$ (Figure 3, Table 1). Taken for the whole country of Niger (~15 million inhabitants) this equals ~120 million \$ per year of nutrients that could be better managed. The conscious management of human excreta would also improve health conditions and reduce environmental pollution.



Figure 3. Two bags of fertilizer were brought along for sensitization sessions in Niger to illustrate the annual amount of nutrients that are present in the excreta from one family

Table 1. Comparing elemental NPK in annual excreta by family with two bags of chemical fertilizer

	N	P	K
Kg NPK/person/year in urine and faeces	2.7	0.45	1.4
Kg NPK/household/year in urine and faeces (9,1 persons/household in Aguié)	25	4	12,5
Kg N, P et K in one bag of urea(50kg) + one bag of NPK (14:23:14) (50kg)	27	3	6

From an agro-economic point of view, the subsidy of 50 US\$ in the Aguié project for a productive toilet can help a family to potentially collect around 80 US\$ worth of fertilizer per year. This is a short pay-back time, but the construction and good use of productive toilets require skill and knowledge. The simple urinals cost next to nothing (~3 \$ for a 20 litre jerry can with funnel) and allows for a much quicker out-scaling. An interesting approach would therefore be to scale up urine recycling via the agriculture sector while sanitation programs promote faeces management. The agriculture extension officers already widely present in the rural areas could disseminate knowledge on urine reuse, and prepare the grounds for further sanitation interventions.

Yet another aspect is that with the decentralization process in Niger the Mayors have been transferred more responsibilities linked to water and sanitation, however they do not yet have neither the competence nor the funds to assume these responsibilities. With this in mind a “Productive Sanitation guideline for the Mayor” was produced in the PS-Aguié project.

Existing linkages with other IFAD initiatives

The productive sanitation project in Aguié was hosted by PPILDA, an IFAD financed rural development project of 17,8 million \$ and implemented during 2005-2013. PPILDA was closely involved in the productive sanitation project and has the capacity to take the approach further in Aguié. Linking this type of pilot project to an existing large rural development project like PPILDA, was very helpful in facilitating the implementation of the project and also for sustaining the project results.

At the end of the project, a study visit to Aguié was arranged with participants from several IFAD funded projects:

- Madagascar: Feno Andrianamanalino, AVSF - SCAMPIS
- Mauretania: Mamadou Geye and Mariko Lassina, AUW
- Rwanda: Patient Maganya, APEPARWA/PAPSTA-KWANUP

- Uganda: Fred Semyalo, UWESO



Abbas from Dan Bidé explains how he has arranged the tests with urine as a fertilizer



Abass show his composting latrine

The program implementation

The overall goal of the project was to improve agricultural productivity to ensure more food security and health for smallholder farmers through PSS (Productive Sanitation Systems).

The specific objectives were:

1. PSS are accepted and have measurable effects on food production in the pilot communities (comparative analysis with other fertilizers or non fertilizers)
2. Other actors in the field of sanitation/agriculture integrate the concepts of PSS in their work and policies

Beneficiaries and outputs

During the course of the project more than 1100 households in eight villages started to collect urine via simple urinals, and 190 households acquired either composting toilets or dry toilets with urine diversion that facilitate the sanitization of feces, for later reuse in agriculture, see Figure 4, Figure 5 and Figure 6. More than 125 m³ of urine was collected during 2009 in the pilot villages. 20 masons and 15 local facilitators were trained and 25 vegetable farmers + 120 cereal farmers took part of the participative experimentation using urine as a fertilizer. The local authorities and NGOs participated in several trainings, and the final study involved people from ministries and national NGO's in Niger as well as international participants from six countries.



Urine can either be transferred from a pot to the jerry can or enter directly. Dug down it is adopted for the squatting position



The composting toilet with urine diversion



The dry toilet in local material except the slab and vent

Figure 4. Urinals and toilets in Aguié, Niger



Figure 5. Application of “liquid fertilizer” either with watering can or with bucket and cup



Figure 6. Examples from the harvest of different crops testing urine as a cover fertilizer.

The project also produced some useful documents and outreach materials:

- A guideline for the productive use of urine in the Niger context
- A productive sanitation guideline for Mayors
- Six short films and three posters
- One article in a peer reviewed journal and two conference articles
- Several illustrated aide memoires and factsheets on different aspects of productive sanitation
- A policy analysis of the sanitation and agriculture sectors and opportunities for PS uptake
- A gender evaluation of the project
- Simplified model to estimate the urine and crop production
- An organoleptic study, evaluating taste and visual appreciation of urine/non-urine fertilized crops
- PHAST tools for participative sensitization on PS in the villages
- Two MSc thesis (urine quality/quantity + cost reduction) and two agro-engineer diploma thesis (using urine in composting and using urine during the dry season).
- A webpage was set up in English and French to facilitate access to the material produced in the project



Figure 7. Examples of outreach material produced - a poster summarizing the main components of productive sanitation and films with local voices from Aguié

Impact

At village level

- The villagers involved in the project acquired an increased awareness on both the danger and the resources present in human excreta, and with the good use of productive toilets and urinals both health and food production can be improved.
- The annual quantity of human fertilizer that can be collected from the average family of nine persons corresponds roughly to one 50 kg bag of urea and one 50 kg bag of NPK, which is worth around 80\$ on the local market.
- Increase in crop production for a variety of vegetables and cereals using human urine as a fast acting nitrogen fertilizer. Each jerry can of urine (25 litres) gave 2-3 kg extra millet grains compared with only base fertilizer.
- Productive sanitation helps to optimize the use of locally available fertilizing resources, which is important in a context where chemical fertilizers are out of reach for many farmers. The price of chemical fertilizers is likely to continue to be variable, and probably increase with peak oil and peak phosphorous in view. Thus, productive sanitation can contribute to reduce the vulnerability of poor farmers.
- Urine collection on household level reduced the nuisance of urine odours in the traditional shower and ablution area, which especially women appreciated.
- Villagers also emphasise the comfort, dignity and pride of having access to a latrine that, if well used, does not have odours or flies.
- The pilot village animators, masons and farmers constitute a local knowledge base that can be used in an up scaling phase. PPILDA count on using these competences, via the formation of a “productive sanitation association”, in the continued work with productive sanitation.
- In two of the villages there is an emerging market for urine, with several hundred jerry cans of urine having been bought by more well off farmers. This potential market for urine could potentially be a motor for the spread of this approach.

At departmental/regional level

- The advantages of collaboration between sanitation and agriculture actors have been clear in the department of Aguié. The trainings have strengthened capacity of especially the agriculture extension officers, the rural engineer and the health official in Aguié. These actors are capable to play an active role in a further promotion on local level.
- The project has created certain “productive sanitation tourism” to Aguié, with several study visits that have taken place during and after the project.

At national level

- Information about productive sanitation is now available in Niger, with local guidelines and tools produced in the project. New knowledge has also been developed with the research (4 MSc) work in the project.
- Representatives from the ministries of health, hydraulics and agriculture participated in the final study visit. These are key persons that can support advocacy initiatives for a further up-scaling of the approach.
- The total annual value of N, P, K in urine and faeces in Niger has been calculated to be worth around 120 million \$. This is a considerable sum, and shows the fertilizing potential of human excreta that can be used safely given that the urine and faeces are treated and applied in a conscious way.

At international level

- The international study trip was appreciated and will hopefully bear fruit in Mauretania, Rwanda, Uganda and Madagascar.
- The project has had good outreach via several activities and articles on international level. The originality of the project lies in the methodology, with agriculture extension workers promoting treated urine and faeces as fertilizers, triggering demand for sanitation via participative tests in agriculture. There has been a strong focus on low cost technologies, which puts emphasis on local material. Combining the composting pit latrine with urine diversion is a new approach that seems promising and that could be of interest elsewhere.
- The experience from Agiue was invited by the Commissioner for Human Right to be presented as an example of a good and innovative sanitation practice.

At the partners' level:

- CREPA has benefitted as an organization by having the opportunity to develop, implement and do research on productive sanitation. The collaboration with PPILDA and the methodology of farmer field schools and inter village visits are important aspects when implementing productive sanitation. This experience has created opportunities for CREPA Niger, with support to other NGOs on capacity building and implementation of productive sanitation.
- PPILDA has added a successful “innovation” to their menu of technologies that are made available in the farmer field schools. The staff has benefitted from the trainings and workshops, and have the capacity to continue the implementation.

With the Aguié project SEI has had a concrete example to feed into the advocacy work on international level for more sustainable sanitation. In the international urine guideline that SEI published in 2010, the Aguié project is referred to and many of the photos in the guideline are from the Aguié project. This project has also been a bridge-builder within SEI, since the sanitation group has collaborated with both the policy group and the water group (modelling). The Aguié project also led on to trials with the triple green approach financed by Sida where productive sanitation is coupled with rain water harvesting and conservation agriculture.

Constraints faced during the implementation

The constraints were more linked to the project management rather than the actual adoption of the productive sanitation approach on the field. The challenge was to coordinate and involve four implementing organizations (CREPA HQ, CREPA Niger, SEI and PPILDA) in a project that was originally designed for one year. Signing the contracts between the institutions took some time and the construction of latrines required acquisition of material such as cement and iron bars, which always take time to accomplish. The rainy season makes construction in rural Niger virtually impossible, which meant that most latrines were constructed towards the end of the project. The short project time also meant that only the use of urine could be evaluated, and not the use of composted or dried faeces. All involved partners would have liked a second year to confirm the first year's results.

The vegetable farmers experienced that the plants were extra thirsty the days after applying urine and required more watering. During the dry season, water availability is a key issue, and hauling extra water is a heavy task.

The adoption of the productive sanitation both in the villages and among other stakeholders was surprisingly fast. Some were sceptical in the beginning, but local arguments for the approach were

developed like the fact that the fields closest to the villages have always given the best yields, since many people go there to relieve themselves. In that case there is no treatment and but nobody ever hesitate to eat the crops. Productive sanitation then becomes a conscious way to improve what done to some extent already. The learning trip to Burkina Faso with five pilot farmers and two people from the project was also important together with the participative experimentations that were done with the farmers. The results from using urine as a fertilizer were very convincing and for farmers “seeing is believing”. Another important aspect was to clearly differ between fresh and treated human excreta. After treatment urine was called “Takin Ruwa” and faeces “Taki Bussasché”, which means liquid and solid fertilizer in the local language Hausa. This way of marketing the fertilizer after treatment makes the mental mind shift easier.

From a religious point of view, sanitation in itself is highly valued, and already the fact of collecting urine reduces smells in the shower area in the compounds. The urinals were either dug down to allow for a squatting position, or the urine was collected in pots and poured into the jerry can. In a Muslim context urine should never touch any part of the body or the clothes. When reusing urine it is important to be protected and to change clothes before prayer. If any urine touched the body or clothes, the solution would be to wash thoroughly with water. These were some simple measures that helped overcome the religious barrier.

Another important aspect is to avoid conflicts between chemical and organic fertilizers. Sanitized human excreta should be seen as something that complements rather than replaces existing fertilizers. Recycling human excreta helps reduce losses in the farm system, but to increase fertility in degraded soils all available resources are needed: animal manure, crop and food residues, chemical fertilizers as well as human excreta. The integrated approach which has been tested in Burkina Faso goes one step further to also includes soil and water conservation techniques together with productive sanitation. Research on integrated soil, water and nutrient management is also done in Niger by SEI, UAM (University of Niamey) and CREPA. The so called triple green approach is using conservation agriculture, water harvesting and productive sanitation is applied together to investigate the synergy effects on crop production.

Sustainability, Acceptability and Accessibility:

Farmers' involvement

The farmers were highly involved in the project. The villagers elected the local facilitators and masons to be trained and a large number of farmers were also involved in participative tests using urine as a fertilizer both during the dry season (vegetables) and rainy season (cereals).

All households had the possibility to start collecting urine using simple urinals, and the households who wanted were also supported to some extent with latrine construction, of either a composting or a dry latrine according to preference. Local identification of extremely vulnerable households was done for targeted support.

A baseline study was carried out for a better grasp of the local context and experience on sanitation and agriculture. The results were shared in village meetings.

The participatory sensitization tools, SARAR/PHAST, convey messages but also helps to build self confidence and pride during the learning process.

The households were also involved much appreciated taste-tests comparing urine and urea fertilized crops.

Measures to support institutional/professional changes

Implication of stakeholders

It was important to involve the local stakeholders from the beginning in the project. A first launching workshop gathered authorities, civil society and village representatives where the concept was explained with ample evidence from experiences elsewhere in the region and the world. A practical session during the workshop was held by Dr Bonzi from CREPA in Burkina Faso on the application of urine to a couple of fruit-trees in the courtyard at the PPILDA office. Reference was also made to the WHO guidelines that acknowledge reuse with risk reduction

The local stakeholders were invited to participate in several trainings and events to be active partners of the project.

Information sharing and tool development

Tools were developed both for facilitating the change process in the villages, but also for advocacy and information to authorities and other stakeholders on both national and international level.

National level:

- A guideline on urine application for the Niger context, <http://www.ecosanres.org/aguie/documents/FicheTechniqueApplicationUrine-BARAGE.pdf>
- A productive sanitation guideline for the mayor: <http://www.ecosanres.org/aguie/documents/GuideDesMairesNiger.pdf>
- Factsheets on different aspects of productive sanitation + FAQ: <http://www.ecosanres.org/aguie/factsheets.htm>
- Capitalization notes on introduction, socio/tech and agronomic aspects of the project : <http://www.ecosanres.org/aguie/researchstudies.htm>
- Institutional study to see how the approach can be the agriculture and sanitation policies: <http://www.ecosanres.org/aguie/documents/AguiePolicyReport-English.pdf>

- Two appearances on the national television news, during the open house event and the international study visit.

International level:

- One peer reviewed article in Sustainable Sanitation Practices:
<http://www.ecosan.at/ssp/issue-03-use-of-urine/article-1/view>
- Two conference presentations (Regional sanitation and hygiene symposium in Accra, Ghana + World Dry Toilet Conference in Tampere, Finland) and the organization of a side-event at the World Water Week in Stockholm:
<http://www.irc.nl/page/50820>
http://huussi.net/tapahtumat/DT2009/pdf/poster_Linus_and_Amah.pdf
http://www.ecosanres.org/aguie/big_sweet_tomatoes.htm
- Organization of a three day international study visit to Aguié with representatives from IFAD funded projects in Madagascar, Mauretania, Uganda and Rwanda, as well as from ministries and NGOs in Niger.
http://www.ecosanres.org/aguie/learning_trip.htm
- A simplified model that provide information on crop productivity increases from using treated urine (Takin Ruwa) as fertilizer as compared unfertilized for growing millet.
<http://www.ecosanres.org/aguie/model.htm>
- Videos: The Productive Sanitation in Aguié project has produced several short films on various aspects of the projects. The films are available to view online via YouTube, and also as downloadable MP4 files with subtitles. Six short films were made in the project, which were useful at workshops, and also available on line for others to be inspired by.
www.ecosanres.org/aguie/films-en.htm
- A 30 min radio emission on RFI (Radio France International) that has regional coverage was diffused in May 2010:
<http://www.rfi.fr/contenu/20100529-assainissement-productif-aguie-apa-niger>

Accessibility of final outputs (physical availability of research outputs and affordability by the poor)

Most outputs from the project are available on the project website (www.ecosanres.org/aguie).

In each village, the local facilitators have a folder with the sensitization tools and aide memoirs. The highly illustrated PS-poster was also made in the local language (haussa) and printed in 60 copies.

The urinals are cheap and the research on cost reduction of the toilets show that the cost of external material and masonry can be reduced from 45\$ to 25\$ and still be performing. The composting latrine with urine diversion is an innovation that has been popular in Aguié. However, urine diversion on the slab is a complexity that could be avoided using a normal latrine slab and complements the latrine with a simple urinal. More organic matter should then be added to the pit, to compensate for the extra amount of urine entering the pit during defecation if it cannot be collected. The storage of large volumes of urine during the dry season is difficult, and the options of adding urine to a compost pile/pit or incorporating it into the field even during the dry season can be viable and low cost alternatives. Projects easily become very technology focused. It is important to keep the function and aim of the technology in mind. The urinals and toilets should be easy to use but

also efficient in their function to facilitate the treatment (in this case storage for urine and drying or composting for faeces), so that reuse can be done with minimal risk. The technology is the mean and not the goal, and the technology in itself does not have an impact if it is not used as it should.

The project has had a good outreach in the sanitation sector, but the approach also needs to be spread and be understood in the agriculture sector. IFAD has the possibility to support capacity building and implementation of productive sanitation to the benefit of small holder farmers around the world.

Gender dimension

A Gender Assessment Specialist from the Belgian Survival Fund held discussions with a few of the families who had undergone the PHAST training and had recently constructed urine diversion latrines:

- Both men and women were very pleased with the latrines for various reasons. In one of the families the Maigida (Male head of household) was disabled and could barely walk with a stick. He explained that thanks to the latrine in the family homestead, he could go to the toilet easily without needing help from others.
- Children were also said to use the latrines rather than defecate around the homestead as before, which has improved the sanitary conditions of the homestead, lessened the number of flies, and led to fewer cases of diarrhoea for the children according to interviews. The women were extremely happy with the latrines because before they had to walk for up to 30 minutes to the bush in order to defecate. Not only was this former practice considered inconvenient but also unsafe at night.
- Women were also better able to manage their menstruation: throwing their old and no longer usable menstrual materials down the latrine rather than having to dig a pit to dispose of it. Custom dictates that women who have just given birth are not allowed to leave the homestead for 40 days. During this time period, the woman continues to bleed and has to rely on female relatives to assist her in cleaning and eventually disposing of the sodden cloths. Women explained that with access to a latrine in the homestead, a woman is now able to take better care of herself without the need for others in particularly personal matters.

Further research needs:

It is clear that treated human urine and faeces are valuable natural fertilizers. The treatment by simple low tech storage, drying or composting is a vast improvement compared to the present practice in most contexts around the world. The reuse of human excreta can be a big help for small holder farmers both from food production and health point of view and the information on how to do this in a safe way needs to be diffused widely. However, more in depth knowledge is needed and future research is desired within following fields;

- Investigate the pathogen die off in composting latrines. The Director of the SDR secretariat (Rural Development Strategy program) in Niger wishes to see more research on health/risk aspects as well as more research on agronomic aspects before integrating the approach into the national SDR program.
- Investigate the risk of salinization from urine use on different soils (the salt we consume is mostly excreted via the urine)
- In depth agro-economic evaluation of the urine value chain - taking into account all the costs for collection, storage, transport and application

- Investigate different alternative storage possibilities for urine, including using the urine as a nutrient source in Terra Preta production which eventually could efficiently incorporate the nitrogen into the stable humus/charcoal complex.
- Evaluate the nutritious and organo-leptic quality of urine and faeces fertilized crops
- Investigate the agronomic quality of faecal compost and elaboration of a national guideline on the reuse in agriculture
- Investigate the synergetic effects of combining the use of faecal compost as a base fertilizer with urine as a cover fertilizer
- Investigate the possibility of combining drip irrigation with urine (fertigation).
- Evaluate the scalability of the “Triple green” approach promoted by SEI for a productive and sustainable soil, water and nutrient management using conservation agriculture, water harvesting and productive sanitation.
- Explore the possibility to combine the productive sanitation approach with the CLTS (community led total sanitation) approach that is now widely promoted in the sanitation sector
- Find ways of improving the resistance and comfort of the latrines:
 - o Ways of treating the cement surface of the slab to better resist urine which in the long term is corroding on cement
 - o Improving the urine diverter to reduce splashing
 - o Continue the development of local ways to make durable vent-pipes instead of PVC pipes
 - o ...
- Investigate the sustainability of the hardware and the software components in the pilot villages

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www.ecosanres.org/aguie

www.ecosanres.org

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www.sswm.info/home

www.sustainablesanitation.info/

Year of Publication:

2011

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