4.5 ORCATAD - DEVELOPING A DATABASE OFEXEMPLARY PRACTICES IN CONSERVATION AGRICULTURE

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ORCATAD - Open Resource on Conservation Agriculture for Trade and Development

ORCATAD (Open Resource on Conservation Agriculture for Trade and Development) is a European Union funded project aiming at promoting conservation agriculture in Lao PDR. In its slipstream it aims to enhance export capabilities. The core of the project consists of the development of a knowledge base of best practices in the field of conservation agriculture. This knowledge base will serve different purposes through the use of ICTs. On the one hand it will be used to improve training and extension services for farmers and farmer groups and on the other hand it will also target at small and medium agro-based enterprises and intermediary business organizations. Partners in the project are the Centre de Coopération Internationale en Recherche Agronomique pour le Développement (CIRAD) from France, the National Agriculture and Forestry Research Institute (NAFRI) from Lao PDR and Wageningen University (WU) from the Netherlands.

Under the umbrella of this project, we have been searching for the expertise of different stakeholders such as government officials from the Ministry of Agriculture and Forestry (MAF), staff from NAFRI and NAFES, officials from the Ministry of Industry and Commerce, from extension personnel at the district level, from traders, from communication and ICT specialists and from people working in international organizations such as FAO and the EU. Topics for discussion were appropriateness, content, relevance and use and distribution of such a database.

The database is centralized in the ORCATAD project. This means that the main question is reformulated into questions such as: How can the database be made of relevance to different kind of end-users? How can the content of the database best be structured? How can the same information on best practices be presented and accessed? What is the best entry for each type of end-user? How can the sustainability of the database be secured?

Mission and Objective

The database has three missions: 1. to ***conserve information***, 2. to operate through providing a ***pool of educational material***, and, 3. to act as a ***promotional and advocacy tool.***

Therefore, the objective of the database is three-fold. First, it wants to conserve a knowledge base for the agricultural sector at large by presenting a selection of exemplary practices and related materials in conservation agriculture. The second objective is to operate as a pool of educational material to be used by extension service providers and educational institutions operating in the same domain. Third, it also wants the database to be of relevance as a pro-

motional tool in the domain of (international) trade and as an advocacy tool in the domain of policy making (at different levels). Through building upon up-to-date, basic and concerned information it aims to be a promotional tool for traders and an advocacy tool for decision makers. As such it will emphasize issues of sustainability (environmental health, economic profitability and social and economic equity).

Specific Target Groups

There are three specific target groups of the database:

1. The first target group consists of extension officers and students in the field of conservation agriculture. The database aims to be of relevance at different levels of education. For general students in agriculture or related disciplines, an overview of basic information and general description of practices will be sufficient. For extension officers on the other hand it is important that the database not only provides an overview of basic information on exemplary practices, but also provides detailed technical information.

2. The second target group can be found in the commercial sector. The database aims to be used as a promotional tool for marketing purposes. This can also be done in combination with other material, like the films that are going to be produced on different aspects of conservation agriculture. Dissemination of the materials in Laos and the Sub-region of the Greater Mekong can be done in cooperation with the Department of Production and Trade Promotion at the Ministry of Industry and Commerce. The Press and Information Officer of the European Union in Laos also expressed his willingness to help in distributing the CD-Rom with the database.

3. The third target group is the national and international community of governmental and non-governmental organizations operating in the domain of agriculture or related domains. For this target group the database can be used as an advocacy tool. The consequences for the content and the functioning of the database are similar to the consequences for using the CD-Rom as a promotional tool in the commercial sector.

Content

The content of the database consists of two main areas and several sub-areas:
1. Exemplary Practices and Training Materials
2. Related Material

a. Selected bibliographies in several fields of interest
b. Selected set of links to relevant information on the internet
c. Networking in conservation agriculture

1. Exemplary Practices and Training Materials

In order to be able to describe the exemplary practices, a set of dimensions for assessing the practices needs to be developed and adopted. Success stories describe practices that are socially acceptable, economically profitable and environmentally sound, and adhere the technical principles of conservation agriculture (permanent soil cover, minimal soil disturbance and crop rotations). However, the database will not only consist of best practices that score high on specific criteria, but will also feature practices that might score high on one dimension and score low on another dimension. This is the reason why the database consists of exemplary practices and not of best practices. The practices are taken from the specific situation in Lao PDR. This does not mean that it could not have any relevance to other countries and regions in the world, but transferring it to another context needs to be done with care.

The selection of the dimensions and the selection of the exemplary practices are guided by the following principles:

• The selection of the dimensions serves an inward looking function as well as an outward looking function. Inward means that the focus is on the quality of life of the farmers and appropriate extension services. Outward means that the focus is on the sector of trade and commerce, policy makers and governing bodies, and the academic and professional communities at large.

• Selection of the exemplary practices will be taken from experiences in the two provinces of Lao PDR; Xieng Khouang and Xarabury.
• The exemplary practices will be selected under the expertise of the staff of NAFRI (PRONAE).

• Exemplary practices will be described in a qualitative way (through descriptive stories). The stories will highlight aspects of the dimensions that are relevant and typical to the particular practice. No sub-criteria will be defined in advance as emphasis will be put on particular characterizing aspects of the selected practices. Each exemplary practice will be accompanied by a so-called 'Quadrangle'-visual, an image that visualizes the scores on the 3 inward looking dimensions (the Quality of Life, Environmental Sustainability, and, the Regulatory Environment and Service Provision) and the 1 outward looking dimension (Commercialization and Advocacy) (see Figure 1.).

• The exemplary practices will also be assessed in a more quantitative way by adding a score on a scale of five on the four dimensions.

The selected dimensions are the following:

• Quality of Life: This dimension is about the sensitivity that a practice has for the improvement of the quality of the life of the farmer and his or her livelihood. The Quality of Life dimension adopts the Sustainable Livelihoods Approach (SLA) as developed by DFID. The quality of life equals a sustainable livelihood and can thus be seen as depending on the different identified capitals. For the purpose of assessing exemplary practices in conservation agriculture on the dimension of quality of life, we have adopted the following capitals as being of relevance: a.) the human capital; b.) the social capital; c.) the physical capital; d.) the natural capital, and e.) the financial capital.

- Human capital is defined by the OECD as "the knowledge, skills and competences and other attributes embodied in individuals that are relevant to economic activity". (OECD, 1998:9). It refers to the kinds and levels of education needed, to training demands and to required skills and technological knowledge. It also includes health and psychological well-being of the farmer.

- Social capital is the whole of social relations that are relevant in one way or the other for production purposes. "For the majority of writers it is defined in terms of networks, norms and trust, and the way these allow agents and institutions to be more effective in achieving common objectives" (Schuller). It refers to community issues and collective organizational requirements. Issues that are of interest here are for instance: sensitivity to labor inputs and availability of labor, sensitivity to gender (un)balances, and sensitivity to cultural embeddings. Social capital also includes cultural embedding and appropriateness. A new practice can for instance be a continuation of an existing practice or the change to the new practice can be too vast, and the gap between the traditional practice and the new practice can turn out to be too big.

- Physical capital consists of non-human assets that are made by humans and are required for or used in production activities, e.g. technical equipment. But besides technical equipment, physical capital also includes infra-structural capital, which refers to communication infrastructures, roads, irrigation dams and any physical improvements made to nature.

- Natural capital refers to water, land, air, plants, etc... This capital is about the potential that nature offers. It is commonly divided into renewable resources (agricultural crops, vegetation, wild life), and, non-renewable resources (fossil fuels and mineral deposits).

- "Financial capital denotes the financial resources that people use to achieve their livelihood objectives" (DFID,). It refers to the availability of cash or equivalents that people apply to improve their livelihood and their quality of life.

The 5 capitals cover the human, inter-human (social), extra-human (man-made artifacts), and non-human (nature) aspects of the quality of life. It is not necessarily so that the larger the capital, the higher the quality of life is. However, it is envisaged that the quality of life is subject to the qualitative existence of these capitals, individually and in relation to each other. The description of the dimension of the 'quality of life' should therefore include reviews of the characteristics of these capitals and score the amount of sensitivity to these capitals – **A high score on this dimension means that the practice has a positive influence on the improvement of the quality of life of the farmers and is thus sensitive to issues related to human, social, physical, and natural capital.**

• Environmental Sustainability: This dimension is about maintaining the qualities that are valued in the natural environment on a long-term basis. To what extent does the practice sustain the environment and conserve agricultural diversity? To what extent are the production techniques environmentally sound? To what extent does the practice have a positive result on the maintenance of biodiversity and the totality of the eco-system? To what extent does the practice promote the natural functioning of the eco-system? Good integrated management aims to maintain enough diversity to allow interesting eco-systemic properties to emerge. – **A high score on this dimension means that the practice scores high on maintaining the natural eco-system and promoting the natural functioning of the eco-system.**

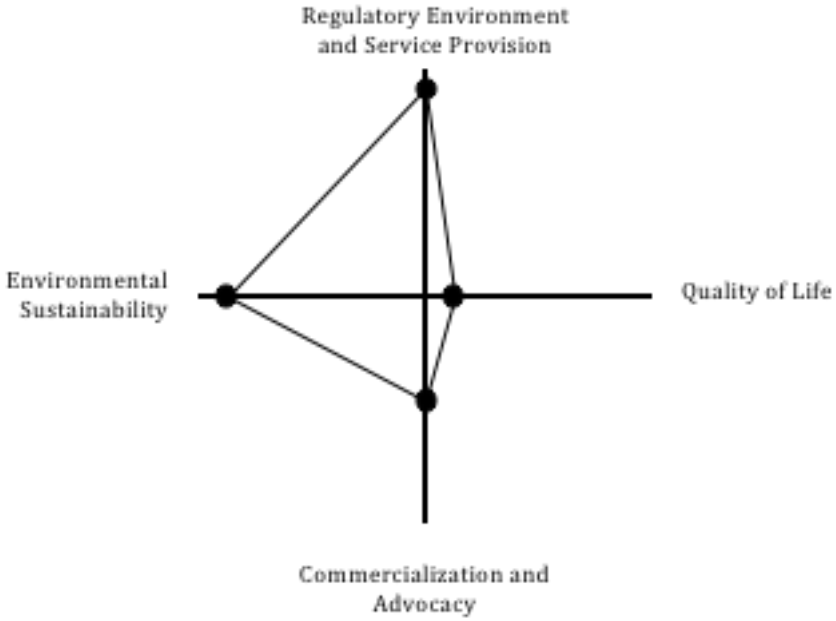
• Regulatory Environment and Service Provision: This dimension is about the availability of a supportive political climate and regulatory environment. It also includes the availability of rural services; extension services and other support services. To what extent is the political and regulatory environment supportive to the practice? Is the practice appropriate and does it fit into the existing environment? Issues of concern are for instance: the political environment; regulation; market access; taxes; the financial context; credit provision; reasonable pricing; effective extension support; facilitating marketing…)? Does the government enable a positive environment? – **A high score on this dimension means that the regulatory environment is supportive towards the practice and that rural services are appropriate and in place.**

• Commercialization and Advocacy: This dimension is of a different nature than the three dimensions identified earlier. It measures the potential that a practice has for trade and advocacy. It captures the 'market outlook' of a practice by identifying characteristics of the practice that have high marketing potential, and thus high economic potential. These characteristics can come out of the above mentioned three dimensions, a combination of these three dimensions, or from a totally different field of operation of the practice. A practice could for instance perfectly fit into the discussion on the establishment of a new 'good for development'-label , or it could

nicely fit within existing trade relations… – **A high score on this dimension means that the practice has (a) characteristic(s) that ha(s)ve high potential for use in (social) marketing.**

Below you will find an example of how the scores on the different dimensions can be visualized in a quadrangle.

Fig 1. Example of a Quadrangle



In this example the selected practice scores high on the dimensions of environmental sustainability and the regulatory environment is supportive towards the practice. Moreover, the service provision to the practice is appropriate and in place. However, the particular practice scores low on the dimension of improving the quality of life for the farmers. This could mean for instance that the practice requires labor that is too hard for the farmers (human capital) or that the community is not ready to adopt the practice (social capital).

Training Materials
The database will include a listing and descriptions of the training materials linked to the exemplary practices. The goal is to have most training material available in 3 languages: Lao, French and English. Currently, most material is available in Lao and French, not in English.

2. Related Materials

2a. Bibliographies
The bibliographies are in development. They cover the following (sub)areas:
• Conservation Agriculture
• Communication, Education and Trade

OECD (1998). Human Capital Investment: An International Comparison, Paris: Organisation for Economic Cooperation and Development.
www.open.ac.uk/lifelong-learning/papers/393B8E05-0008-65B9-0000015700000157_TomSchuller-paper.doc

- Communication, Innovation and Development
- Extension, Training of Farmers and Farmer Field Schools (FFS)
- ICTs (incl. open source) and (Agricultural) Development
- Trade

2b. Relevant information on the internet

The idea is not to have as much links as possible to relevant information on conservation agriculture to be found on the internet, but to have a selected list of quality, trusted and sustainable resources.

2c. Networking

The database will also include basic information on organizations working in the area of conservation agriculture and provide information on main conferences and other meetings. Examples are: the Southern Conservation Agricultural Systems Conference (SCASC) (http://www.ag.auburn.edu/auxiliary/nsdl/scasc/); World Congresses on Conversation Agriculture (see for the 3rd congress: http://www.act.org.zw/congress/index.htm); Latin American Network of Conservation Tillage (RELACO) (http://www.fao.org/ag/ags/AGSE/6to/relaco/sld001.htm); The Conservation Technology Information Center (CTIC) (http://www.conservationinformation.org/?action=about)…

Entering the Database

The database will have two different possibilities for accessing the database. One for extension officers, students and other users who already have at least a basic knowledge of conservation agriculture and are interested in the database as an educational tool. The other entry should be for policy makers, traders, the general public and other users who have no or very limited knowledge about conservation agriculture. Here the database should function as a promotional and advocacy tool.

Database Conservation Agriculture
Training & Education
Promotion & Advocacy

The sub-structure for entering the information as a consumer of the database is under development. An existing idea is to enter the database by clicking on the link "Promotion and Advocacy" through kinds of agricultural products (maize, ricebean, pigeon pea…) and then linking through to the dimensions of commercialization and advocacy that are linked to the product. A possible structure for entering the database as a pool of training and educational material is through the first three dimensions, the material itself and related materials. As a sub-menu it looks as follows:

QAMAR, M.K. (2007). Agricultural Technology Management, Transfer and Commercialization: An Overview with Focus on Asia-Pacific Region, paper presented at the International seminar, "Best Practices in Agricultural Technology Transfer", held from 5 to 9 November 2007 at Colombo, Sri Lanka, organized by the Asian Productivity Organization, Tokyo in collaboration with the Ministry of Agriculture Development and the National Productivity Secretariat, Sri Lanka.

ELLIS, K. & WARNER, M. (2007). Is the Time Ripe for "a Good for Development" Product Label?, ODI Opinion Paper, October. (http://www.odi.org.uk/IEDG/Business_Development_Performance/Papers/ODI_op88_Good_for_Development.pdf)

Promotion & Advocacy	Training & Education
maize	quality of life
ricebean	environmental sustainability
pigeon pea	regulatory environment and service provision
livestock	training material
…	related materials
listing of exemplary practices	listing of exemplary practices

Training & Education
Let us say you are a Bachelor student in agriculture, then you get the following screen when you click on "quality of life":

Dimension of Quality of Life (Ranking)
Score 5
- Practice A
- Practice B
- Practice C
- …

Score 4
- …

Score 3
- …

Score 2
- …

Score 1
- …

If you then click for instance on Practice A, you get the following screen:

Practice A

Dimension of Quality of Life
<description of the dimension>

Links to Other Dimensions
- Link to dimension 1
- Link to dimension 2
- Link to dimension 3

Training Materials

Sustainability of the Database

Monitoring, evaluating and updating
It is proposed to evaluate the database after a period of three years and decide if the information is still of relevance and the database still meets its objectives. It can then also be decided if the database needs to be updated. No updates in the first three years after the release are planned, however if means are available we could update the database on a regular (maybe yearly) basis.

Connecting the database to the existing communication infrastructures

• As an integral part of AKIS -

In order to become sustainable the database must find a relevant and efficient position amongst the existing Agricultural Knowledge and Information System. One should be aware of not creating a parallel system of knowledge and information.

• As a promotional tool for traders and an advocacy tool for decision makers -

Sustainability of a promotional tool is hard to predict. It highly depends on fluctuation in the markets.

Going for an Internationally Certified Database

We also discussed the establishment of a Committee on Certification, especially for the selection of the exemplary practices in conservation agriculture.
Members of the Committee of exemplary practices in conservation agriculture could be the following people:

- 1 specialist from CIRAD
- 1 specialist from Wageningen University
- 1 specialist from FAO
- 2 specialists from Laos (or Great Mekong Sub region)

Going (also) for Open Source

"Going for open source" means in the case of ORCATAD, making the database accessible through non-proprietary means. Unlike Windows, the best known proprietary software (the opposite of Open Source Software) that was developed by the Microsoft Cooperation, Open Source Software (e.g. Linux) is free in the sense as mentioned below.

Free Software, Open Source Software and Libre Software are confusing terms for those who are not familiar with software development as most of the end-users are. Underneath the wings of the World Summit of the Information Society (WSIS), the Free Software Foundation (FSF) Europe produced a document to clarify the concepts (FSF Europe, 2003). This document first of all makes it clear that it is important to understand that Free in Free Software is referring to freedom, not to costs. Quoting one of the first documents that defined Free Software the following four freedoms are referred to: 1.) the freedom to run the program for any purpose, 2.) the freedom to study how the program works, and adapt it to your needs, 3.) the freedom to redistribute copies so you can help your neighbor, and, 4.) the freedom to improve the program, and release your improvements to the public, so that the whole community benefits.

The term Open Source is in fact a term that was introduced in the late 1990s to market Free Software. The term Open Source is less value loaded and was introduced to promote the type of software by using primarily the technological features and not the ideology of freedom that is implicitly associated with the use of the term Free Software. Libre Software is then a third term for the same and was introduced by the European Commission to avoid the ambiguity of the English word Free Software and to end misunderstandings with the term Open Source Software. Open Source Software is therefore not per definition free of charge (although some of it is), but basically tries to break through Microsoft's global monopoly by introducing competition (and cooperation) again.

ORCATAD can best incorporate the ideas of 'open source' by adhering the ideas of freedom as mentioned above. In concrete terms this might mean producing a web based version that is accessible with a Firefox browser and designing a stand alone LINUX version.

Going for a Strategic Location of the On-Line Database

Connecting the database of exemplary practices in conservation agriculture to the website of NAFRI seems the most logical option for positioning the database. It emphasizes the research component of the enterprise and profits from the established position of NAFRI in Laos. The NAFRI website is well developed and incorporates already a database consisting of documents relevant to agriculture in Laos (LAD - Lao Agricultural Database
http://lad.nafri.org.la/lad/index.html). The NAFRI website could as such well develop into a focal point for exemplary practices in the area of conservation agriculture. Setting up a completely new website for the database is not desirable as it might become too isolated.

Going for a CD-Rom too

The database will be published on a CD-Rom too. This CD-Rom publication is of interest to extension officers working in agricultural areas where there is no or slow access to the internet. The second goal of the CD-Rom version is to have a promotional tool with a glossy look, but consisting of quality information.

Selection of Existing Databases in the Field of Agriculture

IReNe – Agriculture, Forestry and Fisheries
Database of Intellectual Resources and Needs in the areas of Agriculture, Forestry and Fisheries
http://irene-db.org/aff/index.php
(You can search with the key word "conservation agriculture (sustainable agriculture)" – found 31 entries on 3 March 2008)

Conservation Agriculture Technology
The database concentrates on equipment and machinery for manual, animal or motorized operation which has been specially designed for the needs of Conservation Agriculture.
http://www.fao.org/ag/catd/

LAD – Lao Agricultural Database
http://lad.nafri.org.la/lad/index.html
The Lao Agriculture Database is the first on-line system to collect Lao agriculture and forestry reports and materials in both the Lao and English Languages. LAD has been established by the National Agriculture and Forestry Research Institute (NAFRI) in collaboration with the Thai AGRIS Center, Library of Kasetsart University (Thailand) to improve the collection and dissemination of agriculture and forestry related information in Laos. The system is based on the AGRIS system of FAO. The database includes research results, surveys, training and extension materials, working papers, as well as policy and strategy reports. The database consists of bibliographic information, abstracts and to a limited extent, full text digital files.

Pakistan Agriculture Database
http://www.parc.gov.pk/data/CatPak/catalog.asp
Database containing bibliographic information of literature published in Pakistan or elsewhere in the world about Pakistan agriculture. It is facilitating the scientists to identify, locate, and use research literature. From 1997, abstracts have also been added. Total records in the database are more than 53,000.

Betuco – Documents on Conservation Agriculture
http://www.betuco.be/Eng/ca_doc-eng.htm
Listing of many documents on conservation agriculture.

EarthTrends – The Environmental Information Portal – Agriculture and Food
http://earthtrends.wri.org/searchable_db/index.php?theme=8

Selection of Related Projects and Websites

Conservation Agriculture
http://www.fao.org/ag/ca
Website of FAO on conservation agriculture

Conservation Agriculture Portal
http://www.fao.org/ag/agl/agll/prtcons.stm
Conservation Agriculture Portal of the FAO

Supporting Conservation Agriculture for Sustainable Agricultural and Rural Development (Phase II)
http://www.nrsp.org/database/project_view_print.asp?projectid=485
Tanzania and Kenya, project period: 07/05/2007 to 14/05/2010

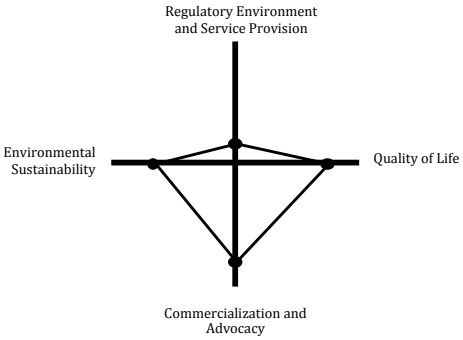
Knowledge Networking for Rural Development in Asia/Pacific Region
http://www.enrap.org/

Lao Extension
http://laoex.org/

NAFRI - NAFES
http://www.laolink.org/

Examples of Database Entries

Improved Pastureland and Cattle Fattening Opportunities on the Plain of Jars (Xieng Khouang)
On altitude plains in Xieng Khouang, large areas of savannah grasslands are "under-utilized" by smallholders with main farming systems based on lowland paddy fields, livestock production with extensive grazing on savannah grasslands and off-farm activities. This ecology represents at least 60,000 ha on three districts (Pek, Phoukhouth and Phaxay).
Improved pastureland is established using no-till technologies (no ploughing, no burning) and the main forage specie used is *Brachiaria ruziziensis* well adapted to acid soils. Native grasses (Themeda sp., Cymbopogon nardus, Hyparrenhia sp.) are controlled by spraying systemic herbicide (Roundup, 3 to 4l/ha) one month prior the sowing. Organic (thermophosphate) and mineral (urea and KCl) fertilizers are broadcasted before sowing (thermophosphate and KCl) and during the rainy season (urea, KCl).



Dimension 1. Quality of Life

Specific training is needed to start this system based on the establishment of improved pastureland. However, farmers have the required skills and technical knowledge to become rapidly independent in establishing new fields and in managing cattle in existing pastures (cattle grazing managed in blocks to allow good forage growth and appropriate fertility management). Low labor input is required to establish pastureland, but equipments (hand tractor, sowing machine, and sprayer) are needed to conduct these activities; they can be shared by several families. However, animals' management required reasonable labor for animals' care and daily water provision.

This system requires initial investment to establish pastureland (fencing, land preparation, seeds, and fertilizers) and to conduct cattle fattening activities (young cattle stock of the family and/or possibility to buy cattle). Infrastructures (equipments) and financials are the more constrained capitals. Credit is essential in this system.

No-till system showed very promising results allowing the use of new lands on the Plain of Jars, increasing the productivity of such lands, and generating new incomes. Forage seed harvesting is the only activity performed during this first season and cattle fattening activities started the second year in order to allow a good establishment of the pasture the first year. Five young cattle can be fattened per hectare and an average farmer can get a net income of 300 USD (not including seed production).

Process of land allotment has been conducted by communities in different villages where such systems have been promoted. This change from community land management to individual land management has positive and negative impacts. Positive in generating new incomes and increasing the productivity of the land allowing in the near future crops diversification as rice. Negative impact if the land "allocation" is not well distributed (equitable access to land) between members of the same community creating social conflicts.

This system scores high (4) for this criterion due to new land accessibility, generating new commercial opportunities, and increasing incomes. Main constraints are based on infrastructures and financial capitals particularly availability for mechanization and cattle or the possibility to access to credit to buy animals and equipments.

Dimension 2. Environmental Sustainability

The soil is not disturbed by mechanical action while land preparation is based on direct sowing of forage species after control of natural pasture land. Before sowing, in order to control native grasses, herbicide (glyphosate) is used and mineral fertilizers (urea and KCl) are broadcast allowing good establishment of the forage specie.

FSF Europe (2003). Free Software (a.k.a. "Libre Software" or "Open Source"), Free Software Foundation Europe (http://fsfeurope.org/projects/wsis/fs.html, last accessed: 4 March 2008).

Thermophosphate is classified as organic product.
This system improves soil fertility in a broad sense: physical (bulk density, soil permeability and aggregate stability), biological (soil diversity) and chemical (increase of soil organic matter and stock of organic carbon) characteristics. Use of living fences increase flora (multipurpose species) and fauna (insects, birds) diversities.
This system scores medium (3-4) for this criterion.

Dimension 3. Regulatory Environment and Service Provision
Animal fattening is clearly related to market access and meat demand. Rural areas of Laos have traditionally struggled to find markets for products because of low population density and poor transport links. However, Xieng Khouang province has begun to show a high commercial rate of cattle export to Vietnam (Onekeo, 2005; Syphanravong et al., 2006) and the recent experiences of the Forage for Smallholders Projects (CIAT-NAFRI) and the Small Scale Agro-enterprise Development in the Uplands (SADU-CIAT) show increasing commercial opportunities in places where smallholders are growing forages for cattle feeding. However, market chain has to be improved; traders raise that administrative format and tax contributions have to be simplified to enhance commercialization between districts, provinces and Vietnam.
The local ecologies on schist and granite present good physical properties but low mineral contents (Hacker et al, 1998) with high deficiencies of N, P, K, Ca, Mg and micronutrients (Zn, Bo, Mn). Thermophosphate addition is thus essential, providing reasonable quantities of Ca, Mg and P and allowing implementation of efficient livestock production and cropping systems. A market channel for such fertilizers has been organized by PRONAE in Xieng Khouang province through Vietnamese traders, but this channel is not already operational to scale-up this system.

Moreover, specific equipment adapted to local economic conditions (sowing machine for hand-tractor) must be promoted to decrease labor inputs for land preparation and sowing. The other limiting factor is that the system is perceived as requiring an initial cash investment and credit access is essential.

Promising results have been recorded in producing forage seeds for Brachiaria species. Development of specific market channels for seeds could indirectly improve pasture management, avoid high stocking rates and generate new income that could be invested in fertilizer and animal care. The Lao National Agro-Ecology Programme (PRONAE) started promoting forage seed production and the Small Scale Agro-enterprise Development in the Uplands (SADU-CIAT) initiated some activities in designing and facilitating the implementation of agro-enterprise.

On these high plains, innovative farming systems based on direct mulch-based cropping and better integration of livestock and cropping activities could be stable and profitable if, at the same time, economic incentives (access to market, inputs, credit, agriculture equipments and livestock product processing) are promoted.
To conclude this system scores very low (1) for this criterion due to the absence of environment structuring: lack of credit access, inputs, specific equipments, and technical supports from extension agencies.

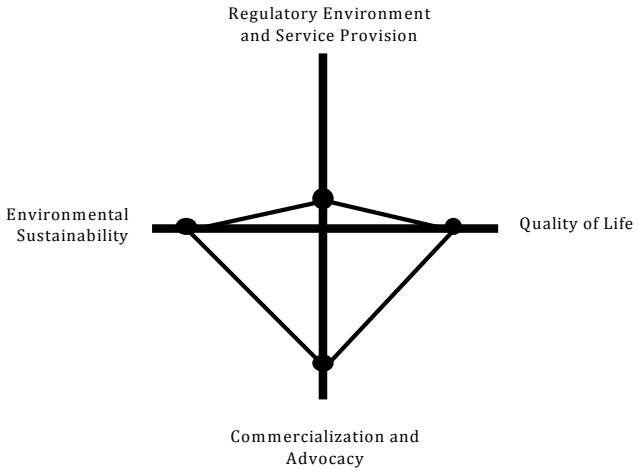
Dimension 4. Commercialization and Advocacy
Pastureland improvement and no-till system show very good results (reducing production costs and land erosion) on the Plain of Jars and could be extended to staple (rice), cash (maize, soybean), and niche crops (sesame, buckwheat) production.

In conclusion, despite positive economic and technical results with cattle fattening, a global approach involving credit access plus technical and political support has to be defined if productive and efficient systems are to develop in this ecology. This poses a great challenge which, if grasped, could yield great benefits in the upper part of the Nam Ngum river basin.

This system scores high (4) for this criterion due to its potential for commercialization and being a good example of advocacy for donors and policy-makers.

Training Materials
<<to be filled>>

Rainfed Rice, Improved Pastureland and Cattle Fattening Activities on the Plain of Jars (Xieng Khouang)
Several options are available for farmers to regenerate and open new lands on the ecology of the Plain of Jars. The first step is based on direct sowing of forage species to conduct cattle fattening activities and to eventually regenerate soils for annual cropping (see previous system). The second system is to associate rice and forage specie to produce a staple crop for farmer and to establish, the same year, pastureland for livestock activities. This system differs from the previous one only by this association between rice and *Brachiaria ruziziensis*; all others technical operations are identical.



Dimension 1. Quality of Life
No-till system showed very promising results allowing the use of new lands on the Plain of Jars, increasing the productivity of such lands, and generating new incomes for the families. This association has positive trait regarding crop diversity and income generation on an ecology generally used for extensive grazing and lowland paddy. Direct benefits of this first season are i) rice and ii) forage seed production which can be sold to other farmers in the village. For the coming seasons, incomes are generated by cattle fattening activities that can be conducted indifferently by man or woman.

Specific training is essential to implement this system. However, human capital, as skill and knowledge, is available to implement such system. Main labor inputs concern rice harvesting and other cultural operations as land preparation and sowing requires low labor if specific equipments are available as sowing machine and sprayer.

Process of land allotment has been conducted by communities in different villages where such systems have been promoted. This change from community land management to individual land management has positive and negative impacts. Positive in generating new incomes and increasing the productivity of the land, but negative impact if the lands are not well distributed (equitable access to land) between members of the same community creating social conflicts.

The main constraints of this system are linked to the infrastructures and financial capitals and the needs for:
• Specific direct sowing machine for tractor or hand-tractor to sow rice and forage specie,
• Specific short cycle rice cultivar in order to complete his cycle before the total establishment of the forage specie which becomes very competitive for nutrients, water and light energy,
• Cattle availability.
This system scores high (4) for this criterion due to new land accessibility, generating new commercial opportunities, and increasing incomes.

Dimension 2. Environmental Sustainability

The soil is not disturbed by mechanical action while land preparation is based on direct sowing of forage species after control of natural pasture land. Before sowing, in order to control native grasses, herbicide (glyphosate) is used and mineral fertilizers (urea and KCl) are broadcast allowing good establishment of the forage specie. Thermophosphate is classified as organic product.
This system improves soil fertility in a broad sense: physical (bulk density, soil permeability and aggregate stability), biological (soil diversity) and chemical (increase on soil organic matter and organic carbon) characteristics. Use of living fences increase flora (multipurpose species) and fauna (insects, birds) diversities. This system scores high (4) for this criterion.

Dimension 3. Regulatory Environment and Service Provision

As described previously the main constraints are related to:

- Low soil fertility and the necessary use of organic and mineral fertilizer. Market chain has to be organized at the local level between Vietnamese traders and local providers,
- Access to specific equipments as sowing machine and sprayers and inputs (forage seeds and herbicides),
- Access to credit provisions to buy inputs, equipments and cattle.

Extension officers have to give technical support and information to smallholders regarding the choice of forage species and rice cultivars.
On these high plains, innovative farming systems based on direct mulch-based cropping and better integration of livestock and cropping activities could be stable and profitable if, at the same time, economic incentives (access to market, inputs, credit, agriculture equipments and livestock product processing) are promoted.

This system scores very low (1) for this criterion due to the absence of environment structuring: lack of credit access, inputs, specific equipments, and technical supports from extension agencies.

Dimension 4. Commercialization and Advocacy

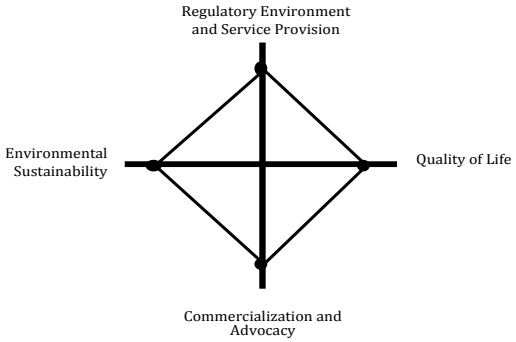
This ecology has a great potential for agricultural productions and the promotion of this system is directly related to political decisions and the recognition to invest in this location and in this alternative to improve livelihoods and to generate new commercial opportunities at the provincial level.

Opening new rainfed areas for rice production on a small-scale basis is a great challenge that could benefit the entire population of the province. The cost of this operation will be low regarding funds invested on lowland paddy fields infrastructures on the Plain of Jars which are globally unused due to the low soil potentiality, lack of alternatives during the dry and cold season, and poor social management of the irrigation network.
This system scores high (4) for this criterion and particularly as a good example of advocacy for donors and policy-makers.

Training Materials
<<to be filled>>

Maize Production under No-Till System and Intercropping with Rice-Bean (Southern Xayabury)

Over the past fifteen years, farming systems have changed drastically in Laos, with swidden systems giving way to more modern agricultural technologies in many areas. In southern Xayabury, traditional systems have collapsed, with a transition from subsistence agriculture to intensive cultivation of cash crops, led by the demands of the Thai market. Notable changes in agricultural practices have included the adoption of heavy mechanization and use of pesticides. With the support of local traders, maize is now widely sown throughout the region and is spreading to more areas every year. With agricultural intensification, rotational cultivation systems and fallow periods are disappearing, being progressively replaced by a 'resource-mining' agriculture that has serious social and environmental costs, including increased soil erosion (leading to destruction of roads and paddy fields), loss of soil fertility, and chemical pollution of the environment. In view of this situation, the Lao National Agro-Ecology Programme (PRONAE) is implementing an iterative research-development approach oriented on Conservation Agriculture to find innovative systems to revert, the present resource-mining practices in southern Xayabury into no-till system based on permanent soil cover, no soil disturbance, crop rotations and use of relay/cover crops.



Many systems are actually under adoption and validation process by farmer groups. The system described hereafter refers to the intercropping of rice-bean with maize. Maize is commonly sown at the beginning of the rainy season from end of April to mid of May and rice-bean is intercropped in August when maize leaves become senescent and sunshine is sufficient to allow this additional crop to germinate. Maize is commonly harvested in September and rice-bean in earlier December. Rice-bean is also one of the main cash crops commonly used since several decades by smallholders. This system is promoted mainly in Paklay and in some locations in Kenthao districts where farmers produce maize every year due to good soil potentiality and where is very difficult to promote rotational sequence.

Dimension 1. Quality of Life

No-till system for maize production and intercropping with rice-bean showed promising impacts on quality of life, particularly in:

- Reducing production costs for land preparation (ploughing),
- Increasing labor productivity and net income,
- Reducing labor inputs particularly for sowing and manual weeding,
- Reducing greatly the use of herbicide for land preparation and weeds management during maize cycle due to the good weed competitiveness of rice-bean,

• Reducing contact for man, woman and child with seed coated with insecticide using sowing machine,
• Increasing spatial and temporal crop diversity (maize + rice-bean, the same year on the same field),
• Maintaining and improving soil fertility.

Higher income is generated with this system due to soil improvement and better weed control. Rice-bean contributes also to this income even if the yield is relatively low due to late sowing in the season.
However, in order to prevent grazing of rice-bean at the beginning of the dry season, to preserve residues and cover crops during the dry season (problems with wild-fires and cattle grazing), modification of collective land management have to be defined and accepted by the community. These social changes occurred in some locations and are under discussions in others villages. This process should be iterative and conducted by the own community to avoid conflicts between farmers and between farming components (annual cropping and livestock).

This system scores high (4) for this criterion due to several aspect presented above and to the reduction in use of herbicides.

Dimension 2. Environmental Sustainability
This no-till system and cropping sequence based on maize and rice-bean intercropping presents several positive traits: i) improvement of soil fertility (physical, biological and chemical) and biodiversity, ii) participate to carbon sequestration, and iii) reduce weed pressure by biological control (integrated management of weeds through shade and reduce use of herbicide). Locations where rice-bean is very well established allowed to avoid use of herbicides at the beginning of the rainy season. Thus, this system scores high (4) for this criterion.

Dimension 3. Regulatory Environment and Service Provision
In southern Xayabury since several decades cropping is mainly based on cash crops production as maize, rice-bean, sesame, Job's tears and peanut. In this region, farmers have good access to market, to credit and inputs due to efficient provider's network for sale and supply.

However, regulation and modification of community land management during the dry season would be useful to preserve, as much as possible, residues on the field for the coming cropping season and to improve the integration between cropping and livestock components.

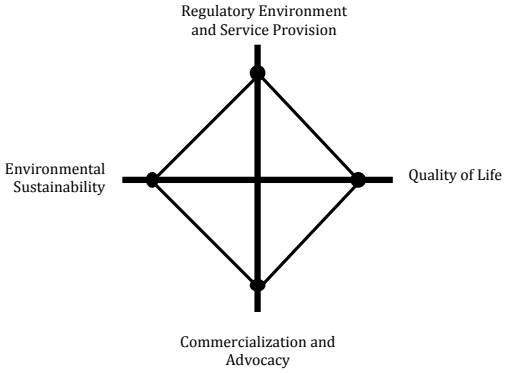
Access to specific equipments, as sowing machines for hand-tractor and hand-jab seeder to intercrop rice-bean with maize, is necessary to improve the dissemination and adoption of this system.

Even if regulations have to be integrate regarding credit (mainly done by traders with high interest rates) and collective land management, we conclude that this system scores high (4) for this criterion due to the actual situation characterized by a high level of commercial commodities.

Dimension 4. Commercialization and Advocacy
This system is a good example of advocacy for policy-makers scoring high for the quality of life, environmental sustainability and regulatory environment. On the other hand the potential for commercialization is also high due to the fact that this commercial product could be in the near future producing under organic management.

Training Materials
<<to be filled>>

Maize Production, No-Till System and Crop Rotation (Southern Xayabury)
The system described hereafter refers to a rotational sequence between maize and rice-bean under no-till systems and residues management. This system has been widely adopted by farmers in Botene district to decrease the risks related to the soil potentialities (low soil fertility and low water retention capacity due to sandy soils).



Dimension 1. Quality of Life
No-till system for maize production and rotational sequence with rice-bean showed promising impacts on quality of life, particularly in:
• Reducing production costs for land preparation (ploughing),
• Increasing labor productivity and net income,
• Reducing labor inputs particularly for sowing and manual weeding,
• Reducing greatly the use of herbicide for land preparation and weeds management during maize cycle due to the good weed competitiveness of rice-bean,
• Reducing contact for man, woman and child with seed coated with insecticide using sowing machine,
• Maintaining and improving soil fertility.

The main difference with the previous system is based on farmer' strategy related to soil fertility, climatic and economic risks in producing maize every year (intercropped with rice-bean) or in having a rotational sequence between two main crops. Market price of rice-bean can be erratic one year from another one and productivity is susceptible to rainfall distribution in September and October. Usually, farmer who adopt this rotational sequence are located on sandy soil (botene) or in degraded areas (southern kenthao) where cropping maize every year is not highly profitable.

However, in order to preserve residues and cover crops during the dry season, modification of collective land management have to be define and accept by the community. These changes occurred in some locations and are under discussions in others villages.
This system scores high (4) for this criterion due to several aspect presented above and to the reduction in use of herbicides.

Dimension 2. Environmental Sustainability
This no-till system and cropping sequence based on maize and rice-bean sequence presents several positive traits: i) improvement of soil fertility (physical, biological and chemical) and biodiversity, ii) participate to carbon sequestration but less than maize + rice-bean system, and iii) reduce weed pressure by biological control (integrated management of weeds through shade). Thus, this system scores high (4) for this criterion.

Dimension 3. Regulatory Environment and Service Provision
In southern Xayabury since several decades cropping is mainly based on cash crops production as maize, rice-bean, sesame and peanut. In this region, farmers have good access to market, to credit and inputs due to efficient provider's network for sale and supply.

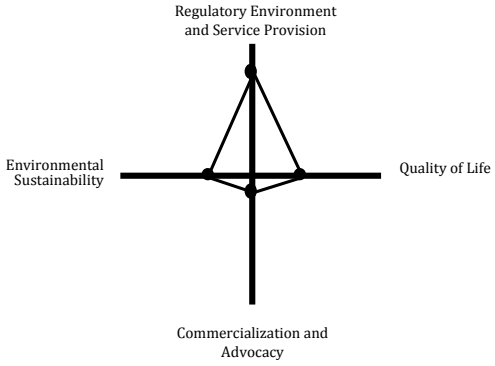
However, regulation and modification of community land management during the dry season would be useful to preserve, as much as possible, residues on the field for the coming rainy season and to improve the integration between cropping and livestock components.

Access to specific equipments, as sowing machine for hand-tractor, is necessary to improve the dissemination and adoption of this system.
Even if regulations have to be integrated regarding credit (mainly done by traders with high interest rates) and collective land management, we conclude that this system scores high (4) for this criterion.

Dimension 4. Commercialization and Advocacy
This system is a good example of advocacy for policy-makers scoring high for the quality of life, environmental sustainability and regulatory environment, it scores 4.

Training Materials
<<to be filled>>

Maize Monoculture in Southern Xayabury
PRONAE followed an iterative process to promote not-till systems in this region. Regarding conventional land management based on ploughing, burning of residues and use of herbicide, the first step was to modify the land preparation shifting from mechanical action to no-till system and residues management of the former crop.



Dimension 1. Quality of Life

Positive traits of no-till system and residues management for maize production are:

• Reduction of production costs for land preparation (ploughing),
• Increasing labor productivity and net income,
• Reduction of land erosion,
• Reduction of labor inputs,
• Reducing contact for man, woman and child with seed coated with insecticide using sowing machine.

However, this no-till system is incomplete regarding the main functions provided by Conventional Agriculture. Weed control is not efficient due to the absence of crop rotations and use of herbicide tends to increase with years increasing risks of environmental pollution and intoxication of farmers by misuses. This system is clearly not a solution on medium and long-term processes and should be only considered as a first step to promote no-till systems, rotational sequence and use of cover crops. The main constraint refer to the infrastructures capital and the needs of specific equipments to reduce labor requirements for land preparation and sowing.

This system scores medium (2-3) for this criterion due to positive but also negative traits on medium-term process.

Dimension 2. Environmental Sustainability

This no-till system based on maize monoculture can be described as follow:

- Reduction of land erosion but inefficiency of this system to control soil erosion,
- Increase use of herbicides due to maize monoculture and risks of soil and water pollution,
- Low soil improvement due to low level of dry matter input.

Thus, this system scores medium (2) for this criterion.

Dimension 3. Regulatory Environment and Service Provision

In southern Xayabury since several decades cropping is mainly based on cash crops production as maize, rice-bean, sesame and peanut. In this region, farmers have good access to market, to credit and inputs due to efficient provider's network for sale and supply.

Access to specific equipments, as sowing machine for hand-tractor is necessary to improve the dissemination and adoption of this system.

Even if regulations have to be integrate regarding credit (mainly done by traders with high interest rates) and access to equipments, we conclude that this system scores high (4) for this criterion.

Dimension 4. Commercialization and Advocacy

This system is not a good example of advocacy for decision-makers or potentialities for commercialization and this system scores low (1) for this criterion.

Training Materials

<<to be filled>>