Good Practices: Agricultural Technology


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(Liccia Romero, Caroly Higuera, José Aguilar, Micheline Bouerim and Elvira Ablan)
Title of Best Practice: More Benefit from Less Land: Rice-Pulse as vegetable + fodder, as a more profitable cropping pattern for resource-poor farmers in Bangladesh

Country: Bangladesh, Ishurdi, Pabna

Authors: Omar Ali¹ and Asutosh Sarker²

Category of Practice: Cropping systems intensification

Context and Genesis

Brief Description of the Production or Service System
Bangladesh is a densely populated country and day by day the population per unit area increases but cultivable lands decreases which is alarming for growing economy of the country. Where as, after Transplant Aman Rice i.e. monsoon rice (July- December) harvesting maximum lands remains fallow before boro transplantation i.e. spring rice (January-May). But there is an ample to cultivate winter pulses as relay crop for vegetable and fodder. For better establishment of pulses in between two rice as relay which varieties of monsoon and spring rice are suitable is not known to the farmers.

Considering the above point of view, the present investigation was undertaken to find out the economically viable pulses (as vegetable + fodder crop) within the fallow period of monsoon rice - spring rice cropping pattern and as well as to find out the suitable variety of monsoon and spring rice for better establishment of pulses for more benefit of resource-poor farmers in Bangladesh.

In this innovative cropping pattern, 1st crop was transplant aman rice i.e. monsoon rice (July-December). Thirty, days-aged seedlings of monsoon rice (var. BR-32, BR-39 and BINAdhan-4) were transplanted by maintaining spacing 25cm x15 cm on 10 July in 2002 and 17 July in 2003, respectively. Fertilizers were used @ 60-40--40-20-10 kg/ha, N-P₂O₅-K₂O-S and Zn in the form of Urea, Triple Super Phosphate, Muriate of Potash, Gypsum and Zinc Sulfate, respectively. Except N, all fertilizers were used at final land preparation but N-was top dressed into 3 equal split at 15 Days After Transplanting (DAT), 30 DAT & 45 DAT. Weeding and other intercultural operation were done as and when necessary. The crop was harvested on 6 November in BR-39, 17 November in BR-32, 12 November in BINAdhan-4 in 2002, respectively and 19 October in BR-39, 27 October in BR-32, 23 October in BINAdhan-4 in 2003, respectively where preceding rice-stubble height was maintained by 30 cm for better establishment of succeeding relay pulses.

2nd crop, pulses (Lathyrus var.BARlkhesari-1, Chickpea var.BARIchhola-5 and Field pea var. Norial local) were broadcast in the above existing rice field before 15 days of rice harvesting,

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just after drained out of water from the rice field. Fertilizers P$_2$O$_5$-K$_2$O @ 40-20 kg/ha were applied in the rice field before 2 days of pulses seed sowing. N-fertilizer @ 40 kg/ha was top dressed into 3 equal split at 20 Days After Emergence (DAE), 40 DAE and 60 DAE and it was used at afternoon due to less soil moisture. Shoot picking (7.0-7.5cm) i.e. vegetable harvesting was started on 52 DAE. The last harvest was on 102 DAE. Akkas et. al. (2000) reported the similar result in chickpea. After the last harvest of vegetable, pulses plants were cut and weighed and used for fodder.

3rd crop was boro rice i.e. spring rice (December-May). After fodder harvesting 35 days aged seedlings of BR-28 and 60 days aged seedlings of BR-29 and BINAdhan-6 were transplanted by maintaining spacing 25cm x15 cm on 7 February in 2003 and 8 February in 2004, respectively. Fertilizers were used @ 60-80--40-20-10 kg/ha, N-P$_2$O$_5$-K$_2$O-S&Zn in the form of Urea, Triple Super Phosphate, Muriate of Potash, Gypsum and Zinc Sulfate, respectively. Except N, all fertilizers were used at final land preparation but N was top dressed into 3 equal split at 15 DAT, 30 DAT and 45 DAT. Weeding and other intercultural operation were done as and when necessary. The crop was harvested on 3 in BR-28, 13 in BR-29 and 21 in BINAdhan-4 in 2003, respectively and 3 in BR-28, 12 in BR-29 and 20 in BINAdhan-4 in 2004, respectively.

Problem Issue that Gave Rise to or was to be Tackled
Bangladesh is a densely populated country and day by day the population per unit area increases but cultivable lands decreases which is alarming for growing economy of the country. Where as, after monsoon rice harvesting maximum lands remains fallow before spring rice transplantation. But there is an ample t cultivate winter pulses as relay crop for vegetable and fodder. For better establishment of pulses in between two rice as relay which varieties of monsoon and spring rice are suitable is not known to the farmers.

Organizations who were Involved in its Design or Implementation
Pulses Research Centre (PRC), Bangladesh Agricultural Research Institute (BARI), Bangladesh. Md. Omar Ali, Senior Scientific Officer (Agronomy).

What were the Key Driving Forces in Managing Change
To popularize the new technology to the farmers and expansion of areas, different type of motivational program like farmers training, demonstration and field day activities were under taken as key driving forces in managing change. For quick area expansion, massive motivational program to the farmers is to be needed.

The Practice

Description of the Innovations or Changes Introduced
In this new cropping pattern, 10-15 days before of monsoon rice harvesting pulses seeds were broadcast in the existing rice field, just after drained out of water. Fertilizers P$_2$O$_5$-K$_2$O @ 40-20 kg/ha were applied in the rice field before 2 days of pulses seed sowing. To enhance fast vegetative growth of pulses, N-fertilizer was applied into 3 equal split. Shoot picking for vegetable was started on 52 DAE and it was continued up to 102 DAE. After last harvest of vegetable, pulses plants were cut and it was used for fodder. Then spring rice was transplanted. In general, farmers practice of Bangladesh, monsoon rice -fallow-spring rice cropping system
which has been changed by the development of this alternate cropping systems involving pulses i.e, rice-pulses (as vegetable + fodder) - rice cropping pattern. This will allow to introduction of pulses crop (as vegetable + fodder) in new areas. Besides this, large fallow areas could be brought under pulses cultivation by this alternate cropping pattern. Traditionally, Bangladesh people chose soft shoot of field pea, lathyrus and chickpea as vegetable due to its good taste and green pulses plants may be used as fodder. In the last two decades, reduction of the pulses area has reduced the vegetable and fodder availability, thereby affecting animal health. This new innovation increases the availability of green vegetable for human and green folder for animal. Finally, BINAdhan-4- field pea (as vegetable + fodder) – BINAdhan-6, a profitable cropping pattern has developed for resource-poor farmers in Bangladesh.

Resources and Skills Required
The soil must be clay to clay loam and monsoon rice field should be heavy moist during 10-15 days before rice harvesting for pulses seeds germination and subsequent growth and development. Monsoon rice should be transplanted between 1st weeks to 2nd week of July. Pulse seeds must be sown as relay during last week of October to 1st week of November. Preceding rice stubble height should be maintained by 30cm for better establishment and higher production of vegetable and fodder. Fertilizers P2O5-K2O @ 40-20 kg/ha were applied in the rice field before 2 days of pulse seed sowing. For the enhancement of vegetative growth N-fertilizer will be top-dressed into 3-split at afternoon due to less soil moisture. First vegetable harvesting will be start after 50 DAE and will continue 7-10 days interval. Last harvest of vegetable as well as fodder must be completed by the 1st week of February for better establishment and higher yield of spring rice.

Problems Encountered and Solutions Found in Implementing the Practice
Before monsoon rice harvesting i.e, during pulses seeds sowing in the rice field, the residual soil moisture may goes to be dry. To ensure seed germination and subsequent growth and development supplementary irrigation is needed. Aphid (Aphis sp.) infestation was occurred in pulses during vegetative stage. To control aphid, sumithion, a contact pesticide was applied @ of 2m/L water.

Organizations and Champions
To success of this innovation, research, extension and NGO etc. organization, and research, extension and NGO personnel and mass participation of farmers should be needed.

Assessment and Impact

Why it was Considered Successful
A technology is always for the people, by the people, of the people, if it is committed to bring benefit to the society. Good technology must be economically viable and socially acceptable. On this, point of view, this technology will be successful due to:-
- This will allow to introduction of pulses in new areas
- Fallow lands could be brought under pulses cultivation.
- To increase availability of pulses vegetable and fodder production
- It also acts as a catch crop in between two rice and provides an extra income.
- There will be generate a job opportunity through vegetable harvesting to the rural women & children.
- From a sustainable point of view, it will be break, continuous cropping with cereals and also improve the soil health. Yadav et al., (1994) reported that with the inclusion of pulses in the system, soil aggregation, soil structure, permeability, fertility and infiltration rate is to improve fairly.

Evaluation of Benefits
Resource - poor farmers will be gained most and large farmers will be gained least but no body will lost any thing.
- Inclusion of pulses in this cropping pattern i.e. rice-pulse (as vegetable + fodder)- rice, pulse (field pea) produced the extra green vegetable (3.25 t/ha) and fodder (18.1 t/ha) over existing cropping pattern (rice-fallow-rice) which is equivalent to extra monitory advantage as net return of Tk. 34648/ha (1$= Tk. 64).
- It has been created job opportunity for rural women & children which provide Tk. 50-60/head/day.
- It provides 20-60 kg residual N/ha to the succeeding crop. Ahlwat & Srivastava (1994) reported the similar result.
- It provides tasty and nutritious green vegetable for human consumption and green fodder for animal health.

Opportunities for Mainstreaming and Scaling-Up

Suitability for Up-Scaling
This technology will be allowing to suitable to other country which environment. Cropping systems, social behavior and food habit are similar to Bangladesh. It will be easily suitable to the Indian sub-continent and also over all domestic animal producing country.

What has to be Done to Promote it Elsewhere Successfully?
To promote it elsewhere successfully, massive motivation program like farmers training, block demonstration and field day activities have to be done with the collaboration of extension people, NGO personnel and farmers.

References


**Title of Best Practice:** Application of the “Three Reductions and Three Gains” Technique in increasing rice production and rice farmer’s income in Angiang Province

**Country:** Angiang province, the Mekong Delta, Vietnam

**Author:** Ms. Nguyen Thi My Phung

**Category of Practice:** Participatory Applied Research and Field Farmer School (FFS)

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**Context and Genesis**

**Description of the Production or Service System**

An Giang is the largest rice producing province of the Mekong Delta. The total cultivated area is 246,821 ha with rice area accounting for more than 82%. In recent years, with plant diversification, the systems of canals and closed dams were built so the farmers could grow 2-3 crops/year with an average yield of 6 tons/crop.

The IPM program (Integrated Pest Management) had been launched with the support of the FAO (Food Agriculture Organization) in An Giang in 1992. Farmers had an awareness of the importance of eco-systems therefore they have changed their pest management and insecticide application practices. In 1994 the FPR (Farmer Participatory Research) Program was developed in An Giang. Through the FPR program farmers discovered that spraying in the first 40 days after sowing was not necessary. Farmers were encouraged to see for themselves with a simple experiment: they sprayed only part of their crop and compared the yield of the sprayed with unsprayed portion. With the innovations above, the farmers’ income was still low because they did not follow extensive staff guidelines closely enough. They used unreasonably high levels of inputs; the application rates of seed rice (250 to 300 kg/ha), nitrogenous fertilizer (150-300 kg/ha) and pesticides exceeded recommendations.

Agricultural inputs shops are very common so farmers can easily purchase agricultural inputs even on credit. Farmers can sell products to buyers or private, governmental enterprises, and joint-stock companies.

**Social, Economic and Institutional Context**

An Giang is located west of the Mekong Delta between the Tien Giang and Hau Giang. The main ethnic groups found in the province are the Kinh, Khmer, Cham, and Hoa.

The region is located in a monsoon tropical climate where the annual average temperature varies between 26 and 28°C. The two distinct seasons are the dry season, from December to April, and

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3 IFAD Supported Case Study
4 Department of Agriculture and Rural Development, Angiang Province.
the rainy season, from May to November. Floods often occur from the middle of August to the middle of November.

An Giang is an agriculture-based province, where rice and fish are the key products. Industries consist of: processing of agro-forestry and fishery products; handicrafts industries; water supply; trading; services, and so on.

Organizations and Stakeholders
The pilot rice growing program was co-sponsored by International Rice Research Institute (IRRI) and the Ministry of Agriculture and Rural Development (MARD) Plant Protection Department, and was introduced by Agriculture and Rural Development Service of An Giang Province. The Plant Protection sub-Department (PPSD) has implemented the scheme.

The Practice

Description of the Innovations
Three Reductions program consists of:
- Reducing seed rates.
- Reducing nitrogenous fertilizer rates.
- Reducing insecticide use.

Three gains after the implementation
- Increasing crop yield.
- Increasing rice quality (safe quality).
- Increasing the production skills of farmers.

Main Activities

Experimental Aims
- To reduce seed rates.
- To reduce nitrogenous fertilizer rates.
- To reduce insecticide use.

Methods
1) Field selection
- Four good farmers that were enthusiastic for innovation were selected, with fields which had good drainage and convenient transport systems.
- Four experiments were carried out in Spring-Winter and Autumn-Summer rice crops. Every field was separated into two plots, one for Farmer (FP: Farmer plot) and one for 3R.
  * In the farmer plot, farmers cultivated with traditional methods.
  * In the 3R plot, farmers were shown how to plant rice seeding in straight lines with seed rate 120kg/ha and to use reasonable amounts of urea fertilizer based on leaf color chart (LCC).

2) Culture practices
There are the seven main steps in 3R rice culture as follows:
  It is very important to choose a suitable season to grow rice so that farmers can control some dangerous pests such as: thrips, whitefly, smite and yellow rice leaf. On the other hand, rice can develop well in the favorable weather with high yields.
*Rice seed preparation:* Choosing suitable rice seeds for every season with the following criteria:
+ High purity, same size
+ Lack of disease.
+ Lack of weeds.
+ Percentage of seed germination at least 90%.

- Treating seeds in 15% salt concentration (100 kg of rice seed soaked salt in 15% concentration) to remove unfulfilled seeds before incubation.
- Treating seeds chemically to remove dormancy and seed born disease.

*Land preparation/sanitation:* farmers should remove weeds and debris, plowing and drying the fields in Autumn-Summer season. These practices help rice grow well and prevent organic poisoning. Leveling the fields and making small canalets promote seed growth and facilitate herbicide application and drainage at 30 DAS. Manual collection of golden apple snails is necessary to lessen the damage in the next stage.

*Amounts of rice seed:*
100 – 120 kg / ha for broadcast direct seeded rice by hand.
70 – 100 kg / ha for direct seeded rice in straight lines by instrument.

*Weed control* helps prevent competition with weeds for sunlight, moisture and soil nutrients and promote rice growth in the first stage. The level fields facilitate the application of pre-emergence herbicide at 0-1 DAS. Note: if soil is dry at 5 – 7 day after sowing (DAS) the plot should be irrigated to increase the effectiveness of herbicide.

*Fertilizing:*

<table>
<thead>
<tr>
<th>Phase</th>
<th>DAS</th>
<th>Urea</th>
<th>DAP</th>
<th>KCL</th>
<th>Note</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>7 – 10</td>
<td>60</td>
<td>60</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>18 – 22</td>
<td>60</td>
<td>60</td>
<td>30</td>
<td>Adding fertilizer in low-growing places</td>
</tr>
<tr>
<td>3</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Following the Table 2.</td>
</tr>
<tr>
<td>4</td>
<td>60 – 70</td>
<td>20-30</td>
<td></td>
<td></td>
<td>Fertilizing when having symptoms on lack of nutrition.</td>
</tr>
</tbody>
</table>

* Leaf color chart should be used at the second and the third fertilizing phases.

Drainage at 25-30 DAS until the fields are dry is an important practice, aiming at:
+ Limiting useless tillers.
+ Well-aerated condition.
+ Good root growth leading to better absorption of nutrients and stiffer rice stem to avoid lodging
+ Removing organic poisons due to overloaded field.
Third fertilization: After draining the field completely at 25-30 DAS and the fields turn to yellow, irrigation and the third fertilization are started. The amount of fertilizer depends on the day the fields turning yellow (Table 2).

Table 2  The amount of fertilizer for the third fertilization

<table>
<thead>
<tr>
<th>Day of field turning to yellow (DAS)</th>
<th>Urea (kg/ha)</th>
<th>Kali (kg/ha)</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>40</td>
<td>50</td>
<td>50</td>
<td>100</td>
</tr>
<tr>
<td>43</td>
<td>40</td>
<td>60</td>
<td>100</td>
</tr>
<tr>
<td>45</td>
<td>30</td>
<td>70</td>
<td>100</td>
</tr>
<tr>
<td>48</td>
<td>20</td>
<td>80</td>
<td>100</td>
</tr>
<tr>
<td>50</td>
<td>0</td>
<td>100</td>
<td>100</td>
</tr>
</tbody>
</table>

Harvesting: draining the fields 7 days before harvesting, and harvesting when 80% of the paddies are mature. If harvesting later, rice can shatter.

Indicators:
- The amount of tillers in 10, 20, 30, 40, 50, 60, 70 DAS phases (tillers/m²).
- The amount of panicles at 80 DAS phases (panicles/m²).
- Density of insects and percentage of disease at 10, 20, 30, 40, 50, 60 DAS phases.
- Yield (tons/ha)

These indicators are collected at five fixed points (0.2 square meter/fixed point) per plot, every ten days for both 3R and FP.

Results
The result in Figure 1 shows that the amount of tillers at 10 DAS is 498 tillers/m² (3R) and 764 tillers/m² (FP). The tillers grow more and more and get the most tillers at 30 DAS, the tillers of FP are more than 3R (384 tillers). After that tillers decrease by 698 (3R) and 872 tillers/m² (FP) at 70 DAS. It show that the seed rates at 3R fewer than FP (90 kilos/ha) but the amount of panicles per square meter and rice yield are still higher than FP (Table 2 and Figure 3).
Besides, the quality of seed-rice is improved. All experiment plots used specific treated varieties. Meanwhile, trainers talked about seed heath.

Reducing Urea Fertilizer
Depending on the result of Figure 2, the difference in nitrogenous fertilizer rates is 21.38 kg/ha/crop saving 64.14 kg urea/ha/year equivalent 139.4 kg urea/ha/year. So the farmers can save 767,000 đ pesos/ha/year. It is very significant given the unstable price of fertilizer. In addition, reducing nitrogenous fertilizer also decreases environmental pollution.

Reducing Pesticide Application
Although both FP and 3R plots have some main pests such as thrips, leaf folder, smite, and yellow leaf disease, the damage not considerable, farmers still sprayed pesticide many times. The pesticide application of FP is more than 3R 1.58 times (insecticide) and 0.73 times (fungicide) (Table 3) so production cost is also different. It was more important that farmers can find the use of high seed rates and fertilizer lead to high disease infestation.
### Table 3  Amount of rice panicle and pesticide application in F and 3R plots

<table>
<thead>
<tr>
<th>Indicators</th>
<th>3 R (120 kg/ha)</th>
<th>Farmer (210kg/ha)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Thrip/sprout</td>
<td>Leaf folder/m²</td>
</tr>
<tr>
<td>(10 DAS)</td>
<td>3.5</td>
<td>6</td>
</tr>
<tr>
<td>(20 DAS)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>(30 DAS)</td>
<td></td>
<td>6</td>
</tr>
<tr>
<td>(40 DAS)</td>
<td>2</td>
<td>8</td>
</tr>
<tr>
<td>(50 DAS)</td>
<td>3</td>
<td>2</td>
</tr>
<tr>
<td>(60 DAS)</td>
<td>5</td>
<td>5</td>
</tr>
<tr>
<td>(70 DAS)</td>
<td>8</td>
<td>8</td>
</tr>
<tr>
<td>Panicles /m² (80 DAS)</td>
<td>659</td>
<td>712</td>
</tr>
<tr>
<td>Insecticide spray/season</td>
<td>0.82</td>
<td>2.4</td>
</tr>
<tr>
<td>Fungicide spray/season</td>
<td>2.3</td>
<td>3.03</td>
</tr>
<tr>
<td>Difference</td>
<td>1.58</td>
<td>0.73</td>
</tr>
</tbody>
</table>

*Increasing yield, low cost, increasing incomes (one gain)*

*Increased yield:* The average amount of yield in 3R was 0.27 tons/ha higher than FP (Figure 3) due to:
- Reduced pest pressure.
- More reasonable amounts of fertilizer.
- Amount of filled grain per panicle in 3R is more than FP.

These results affirm that seed rates are reduced but the yield of 3R is still more than FP.

Figure 3. Crop yield in 3R and FP
Low cost: The average cost of production under 3R is less than FP by VND 188.6/kg due to the high cost of inputs of FP, particularly the excessive seed, fertilizer and pesticide application rates (Figure 4). This makes farmers feel safe when faced with unstable prices.

Increasing risk-averse incomes: Rice farmers participating in the pilot program can increase incomes to 963,000 VND/ha/crop. These incomes would increase by 211,860,000.000 VND if 3R program is implemented in 220,000 ha/crop (rice area of province per crop). Actually, this additional income is significant and can improve farm families and society.

Increasing Quality (the second gain)
Increasing quality means safer product given the production of rice with 3R reduced fertilizer rates and pesticide application, product would be safer.

Farmers’ Production Skills are Enhanced (the third gain)
Through the experiments, farmers believe in 3R program. The most success is farmers’ skills are enhanced, especially they can use LCC to fertilize and road-seedling drums.

Opportunities for Scaling Up to Province

Goals: scaling up 3R program to province to gain high quality rice with low cost.

Methods
There are eleven districts including 150 communes. There is a plant protection station in each district and a agricultural staff in each commune.

Based on successful results of the experiments, the Service of Agriculture and Rural Development of Angiang province manages PPSD and Extensive Center training Technical staff at Plant protection stations, showing demonstration fields, giving information and brochures of 3R as well as provincial government plans budget for launching the program at districts and communes with two training courses: FFS and Demonstration Field (DF).

- FFS: there are 20 - 30 farmers in a course who are eager to apply innovations.
- Establishing Demonstration Fields to help the transfer of 3R to farmers more quickly.

FFS and Demonstration Fields were conducted. Meanwhile, a 3R competition in the province was implemented to encourage farmers and others to take part in the program.

Results
Propaganda materials
There were in total 87,450 LCCs and 102,980 leaflets, 295 cassette tapes, and 348 small posters and 29 big posters released (Table 4). The purpose of these materials is to motivate farmers to adopt three Reductions and Gains.
Table 4: Released propaganda materials

<table>
<thead>
<tr>
<th>Order</th>
<th>Material</th>
<th>2001</th>
<th>2002</th>
<th>2003</th>
<th>2004</th>
<th>2005</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>01</td>
<td>LCC</td>
<td>200</td>
<td>3,000</td>
<td>15,000</td>
<td>23,500</td>
<td>45,742</td>
<td>87,450</td>
</tr>
<tr>
<td>02</td>
<td>Leaflets</td>
<td>1,000</td>
<td>1,700</td>
<td>18,500</td>
<td>23,000</td>
<td>54,780</td>
<td>102,980</td>
</tr>
<tr>
<td>03</td>
<td>Cassette tapes</td>
<td></td>
<td>145</td>
<td></td>
<td>150</td>
<td></td>
<td>295</td>
</tr>
<tr>
<td>04</td>
<td>Small posters</td>
<td></td>
<td>300</td>
<td></td>
<td>48</td>
<td></td>
<td>348</td>
</tr>
<tr>
<td>05</td>
<td>Big posters</td>
<td></td>
<td></td>
<td></td>
<td>29</td>
<td></td>
<td>29</td>
</tr>
</tbody>
</table>

Use of Line Seedling Drum

Line seedling drums help use less seed rice than manual seeding methods. The application of in-line seeders is encouraged because they bring out stronger rice plant, better photosynthesis, better pest prevention, less fertilizer, easier management and higher yield. It can be seen that use of lineseedling drums greatly contributes to the success of the 3Rs to produce high quality rice. The Agriculture and Rural development Service therefore launched the Project entitled “the Application of line seedling drums” which is implemented under two forms:- Demonstration, field trips and workshops to encourage farmer’s use of line seedling drum.

- District Government advances VND 60 million to provide 150 line seedling drums to local agents (level 1) which sell them to farmers with deferred payment for three continuous crops.
- Saving of 1% and 2% of village Compliment Fund to praise local agents (level 1) if they have sold out 100% or more in-line seeders

Local agent (level 1): extensive station, plant protection station, pesticide shops, district Agriculture & Rural Development Unit open between 1 and 2 local agent (level 1)
Local agent 2: Co-operatives, farmer clubs, pesticide shops, good so-called farmers, village and ward People’s Committees open between 1 and 2 local agents (level 2) which receive in-line seeders from local agents (levels) and sell them to farmers.

Under the Project for four months (one crop season) the number of line seedling drums amounted to 770 pieces, a three fold increase over the period prior to the Project implementation. From 1997 to Winter Spring 04-05 there were only 5,391 pieces consumed across An Giang. So far, some 6,161 pieces are used by 193 seeding service groups Each group consists of 2-10 members managing 2-10 pieces. All the groups usually co-operate with cooperatives, farmers’ clubs and water supply teams. It takes one day for one piece to seed 2-3 ha and the associated unit operational cost is VND 50,000 per hectare.

Basing on the results of the first four farmer experiments in 2001, the An Giang Plant Protection Sub-Department has continued to organize scaling up to the whole province with two forms of training courses for farmers and demonstrations.

In Spring-Winter season 04-05 crop, we conducted the pilot program at one village with 500 hectare (total village area) and got rather good result. After that we continued to make scaling up to eleven districts. Number of local demonstrations scaling up depends on local condition.
During four years of the program (2001-2005), there were in total 432 FFS and 845 demonstrations (Table 5).

Table 5  Number of field farmer school (FFS) and demonstration

<table>
<thead>
<tr>
<th>Order</th>
<th>Content</th>
<th>2001</th>
<th>2002</th>
<th>2003</th>
<th>2004</th>
<th>2005</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>FFS</td>
<td>4</td>
<td>42</td>
<td>78</td>
<td>82</td>
<td>226</td>
<td>432</td>
</tr>
<tr>
<td>2</td>
<td>Demonstration</td>
<td>97</td>
<td>149</td>
<td>220</td>
<td>379</td>
<td>845</td>
<td></td>
</tr>
</tbody>
</table>

By the end of Summer-Autumn Crop 05, there are some of 147,971 farmer participants practicing 3R on some 220,653 hectare, representing 50.41% of rice-cultivated area per year (437,736 ha – 2 crops Spring-Winter 04 – 05 and Autumn-Summer 05) (Figure 5).

Figure 5  Amount of farmer participants and 3R applied area.

**Resources Required**

In addition to technical innovations, the Pilot Program has focused on promoting close links among farmers, processors, traders and bankers, all extension workers, provincial government and the central government officials. Through close co-ordination with bankers, processors and traders, farmers are free from worries about shortages of investment capital, product processing and marketing.

To implement the Program, there is totally VND 2,026,517,000 (USD 128,000) spent for four years. The fund for the program in 2005 was VND 1,109,022,000 (USD 74,000) comprising 18.86% from enterprises and 91.14% from government funds.

**Main Stakeholders and Actors**

Rice farmers, all extension workers, provincial government, Plant protection sub- department (PPSD) and the Plant protection station.
**Main Target Groups**
Rice farmers can apply technical innovations “three reductions” to produce high quality and low cost rice.

**Assessment and Impact**

**Why was it Considered Successful?**
A study shows that farmers can generally reduce seeding rates as well as cut down nitrogenous fertilizer and insecticide applications by 30 -50%, respectively. By adopting these practices, farmers will harvest three benefits that are income increase, pesticide-risks decrease and the environment improves by applying less polluted chemicals. The most successful program can be seen by the extensive application of the Program.

**Evaluation of Benefits**
Rice farmers gain most. In addition to reducing the production cost and increasing income, the Program helped decrease the farmers’ dependence on insecticides and their exposure to unnecessary health hazards. The next benefit group considered is extension workers, provincial government, Plant protection sub department, Plant protection station who make plan to protect crop yield and provide farmers with innovations easier. Pesticide selling shops lost because when adopting three reductions, rice farmers’ buying of pesticides and fertilizers was going down.

**Most Significant Impacts**
High quality and low cost rice, yield increase, in addition to the decrease of nitrogenous fertilizers and insecticides will contribute towards reducing pollution. Moreover, the most significant impacts were poverty alleviation, food security and the livelihoods of the poor.

**Most Significant Outcomes**
The provincial authorities have taken the leading role in scaling up to province in the next five years:

- Target 90% of cultivated area (468,000 ha/year) under the Program application
- Reach over 70% percent of area applied with high quality seed strains for export.
- Reduce seeding rates in straight lines by 80-100 kg/ha at 3R applied area and on average provincial seeding rates is 120 kg/ha.
- Reduce nitrogenous fertilizer rates by 20 kgN/ha/crop.
- Reduce insecticide sprays by 2 times /ha/crop.
- Reduce fungicide sprays by 1 times/ha/crop compared with the old method.
- Help 50% of farmers be aware of and control some main pests in rice paddies such as: Blast, sheath blight...
- Enable 30% of farmers to perfect their skills of rice production.

**Factors Contributing to Successes and Failures:**

**Problems Encountered and Solutions Found in Implementing the Practice**
Besides the support of provincial authorities, the mass media, good skilled farmers and good technicians and so on, there are some issues as follows:

- The irrigation system is not completed -- surrounding 20% still to be finished.
- The coordination between agencies is not synchronized because they don’t understand the targets of the program.
- Lack of technicians
- Language barrier between Vietnamese and ethnic languages.
- Lack of budget for demonstration

Main Reasons Contributing to Success

- The operations of the program are facilitated by the “High quality rice program” which is one of four main targets of the province.
- The interests of agriculture leaders, the aids of local authorities and union and the association with local agriculture expansion have created favorable conditions to deploy the program effectively.
- The information of the program rapidly spreads out thanks to the support of the mass media.
- The farmers are zealous and enthusiastic to register for the program.
- Zealous technicians are experienced in organizing and operating.
- The effectiveness of the cost sharing method 1:1 (province, district), 1:1:1 (province, district, enterprise)

Opportunities for Mainstreaming and Scaling-Up

*In addition to the practices mentioned above, we conclude that it is necessary to consider some key solutions for scaling up:

- Setting up a co-operation or a village-scale demonstrations
- Scaling up to a 100 ha demonstration.
- Holding a competition to motivate stakeholders and farmers to participate
- Providing financial resources in the ratio 1:1:1 (Province: District: Enterprise)

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Titre: La plasticulture itinérante dans les Ziban

Pays: la région des Ziban (sud-est algérien)

Auteurs: Bennoui Foudil

Catégorie pratique: Culture maraîchère primeur en irriguée sous abri plastique

Contexte et sa Génèse

Description du Système de Production
On rencontre, dans la région du Ziban, plusieurs systèmes de production agricoles, dont au moins deux parmi eux, sont dominants. Le premier est un système de production basé sur l’élevage ovin conduit en extensif et se trouve là où l’eau fait rare. Le second est un système de culture oasien qui se caractérise par l’importance accordée, par les exploitants, à la phoeniciculture et plus particulièrement à la variété de datte “Deglet Nour” destinée à l’exportation. A ce système est associé un système d’élevage traditionnel de type familial avec des effectifs très réduits d’ovins et de caprins. Cependant, depuis une vingtaine d’année, les systèmes de production, de cette région, ont subi des modifications majeures sous l’effet de l’introduction de la plasticulture et la mobilisation des eaux souterraines. Les résultats de ce renouveau ont fait de la wilaya de Biskra située au sud algérien, la première du pays en nombre de serres. On en compte, en effet, vers la fin de l’an 2004 plus de 50000 serres. Les biens faits de ce système résident, en fait, dans sa rentabilité financière en premier lieu et les conditions bioclimatiques et de relief en second lieu, mais aussi la disponibilité de l’eau souterraine et de barrage, en plus de la main d’œuvre, venue particulièrement du nord du pays, en tertio.

Contextes Social, Économique et Institutionnel,
Les contextes social, économique et institutionnel, au Ziban, sont favorables. Sociallement, la volonté de maximiser le profit des agriculteurs associée à leur profond attachement à la terres font la source de motivation de ces derniers. Économiquement, la croissance démographique en plus du recul de la pauvreté ont fait, en sorte, que la demande sur les produits primeuristes est en cesse augmentation. Le nouveau contexte économique caractérisé par l’ouverture de l’économie nationale sur l’économie mondiale a permis un approvisionnement large et diversifié des plasticulteurs en intrants nécessaires au processus de production. Le contexte institutionnel, quant à lui, est favorable puisqu’on assiste à une volonté déclarée de la puissance publique qui incite à investir dans l’agriculture et considère le secteur agricole comme secteur prioritaire dans le plan quinquennal de relance économique.

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3 Étude de cas soutenu par IFAD
4 Département d'économie, Université "Mohamed Khider" Biskra, Algérie
Problème Ayant Permis l’Adoption de cette Pratique,
La crise de l’agriculture algérienne, caractérisée par son incapacité de nourrir la population et de ne pas arriver à produire suffisamment de produits dits stratégiques (céréales, lait,...), était à l’origine de l’adoption d’une politique de mise en valeur et de reconversion des systèmes de production peu productifs en régions arides.
A cette crise s’ajoute la crise du chômage qui touche de plus en plus une population active jeune, qualifiée et même diplômée à la recherche du travail. Cette crise déclenche d’autres types de crises, en l’occurrence celle de la légitimité et délinquance. L’autre grand problème est celui de la complexité de la gestion urbaine face au phénomène de migration de la population rural communément appelé exode rural.

Organisations et Parties Prendantes qui ont Participé à sa Conception,
Le ministère de l’agriculture et du développement rural, et ses différentes directions des services agricoles implantées dans les 48 wilayas, en réponse à la demande des agriculteurs issue de leur propres expériences.

La Pratique

Des Innovations ou Changements Introduits
Au début des années 1980, la plasticulture était inexistante dans cette région et la production maraîchère était faible et en dessous de la demande locale. Actuellement, la production de cette région représente selon les données officielles 33 % de la production maraîchère de l’Algérie toute entière. On en compte pour la seule plasticulture plus de 50000 serres.

Principale Activités Réalisées et en Particulier Étapes et Séquences,
La production végétale de cette région demeure jusqu’à présent sans la réalisation d’importantes étapes de développement, car elle se limite à livrer au marché des produits frais sans subir des transformations et loin de répondre aux exigences de l’exportation en terme de respect des normes de qualité, de quantité et du délais exigés par les acteurs du marché international.
Vient s’ajouter à cela la réalisation d’un barrage d’une capacité moyenne à côté d’une plaine d’un millier d’hectares met en valeur tout récemment avec un système de drainage et distribué pour le profit des jeunes chômeurs et universitaires à raison de 2 hectares par bénéficiaire.

Ressources Utilisées

Les Principales Parties Prendantes et Acteurs qui ont Bénéficié des Résultats
Le principal acteur est sans doute l’agriculteur qui a bénéficié d’une structure de financement répartie entre subvention (50 %), crédit bancaire (20 %) et autofinancement (30 %). L’autre acteur est l’entrepreneur qui réalise la construction des bassins d’accumulation et des forages. Les entreprises spécialisées dans la production des équipements hydrauliques ainsi que les revendeurs de pompes, de têtes de stations, d’asperseurs et de canaux d’irrigation étaient de leur part fortement impliqués. Le fournisseur en armatures de serres, de films plastiques, d’engrais et surtout de semences est un acteur incontournable. L’importateur d’installation pour chambre froide a contribué fortement dans la réalisation de ces projets. Il faut noter, cependant, que l’encadrement de l’activité agricole et notamment le suivi des projets d’investissement est sous la responsabilité du bureau autonome de l’ingénieur agronome. Cette forme d’encadrement est conçue pour la première fois dans le but de créer des postes d’emploi pour cette catégorie sans beaucoup de chance d’être recruté. Les intermédiaires commerciaux de tous genres, amant et aval, récoltent l’essentiel de la valeur ajoutée et des marges bénéficiaires empêchant ainsi le producteur et le consommateur de gouter convenablement le fruit de cette pratique.

**Les Principaux Groupes Bénéficiaires**

En terme de subvention, Les principaux groupes bénéficiaires sont les agriculteurs sans exception. En terme d’intermédiaire financier, se sont leurs financiers et assureurs. En amant du plasticulteur se sont toutes les entreprises de fabrication d’outils et de fournitures, d’importation de semences et de matériels, de distribution et de revente. En aval, se sont les intermédiaires commerciaux qui contrôlent le marché de fruits et légumes, les cadres chômeurs qui sont occupés, les industries agroalimentaires qui interviennent en temps opportun pour ramasser toute la production à très bas prix en fin de campagne et le citoyen qui consomme de plus en plus de produits frais.

**L’Évaluation de l’Impact de la Pratique**

Le succès de cette pratique réside dans la capacité du marché à absorber toute la production. Le climat de la région est favorable aux cultures primeur, l’eau souterraine est abondante et la main d’œuvre aussi. Les gens ont adhéré à cette pratique parce qu’elle est financièrement rentable et techniquement possible.

**Evaluation des Bénéfices pour les Parties Prenantes**

Pour la plasticulture de cette région, le mode de faire valoir indirect domine. Il s’agit de recruter des jeunes chômeurs pour plus de 90 % des cas ou bien des familles entières, où femmes, filles et enfants, participent aux travaux agricoles. Si le propriétaire dispose d’un nombre important de serres, il procèdera dans ce cas à recruter plusieurs ouvriers tout en cédons, généralement, trois serres pour chaque ouvrier ou famille d’ouvriers.

Le propriétaire finance les charges de production et les enregistre en détail en présence de ses associés qui maîtrisent, à peu près, la conduite de cette culture et les coûts qu’elle engendre. Le propriétaire offre aux travailleurs et à leurs familles un logement sur site.

Une fois la production écoulée, ils procèdent à la soustraction des charges évaluées à quelques 40000 DA par serre, la valeur des ventes unitaire est, généralement, variable entre 140000 et 200000 DA, ce qui donne un bénéfice net supérieur à 100000 DA par serre. Le un tiers de cette
somme revient à l’ouvrier, c’est-à-dire un minimum de 33333 DA par serre et les deux tiers à son patron, soient 66666 DA par serre. Le revenu moyen des ouvriers est de 100000 DA, procuré généralement, par trois serres, soit un revenu mensuel de 10000 DA pour les dix mois de travaux. Ce revenu est égale au salaire national minimum garantie.

Cet état des choses pousse l’ouvrier à chercher un travail complémentaire chez les phoeniciculteurs voisins s’ils existent. On a constaté sur terrain que ce revenu se consomme en totalité sans épargne et dans l’achat de produits alimentaires et vestimentaires sans pour autant prévoir un changement de leur statut. La femme de l’ouvrier n’a ici que le petit élevage comme source de liquidité. La frange la plus perdante dans cette affaire sont, sans doute, les enfants qui se retirent à un âge précoce de l’école.

Les Impacts les Plus Significatifs

La plasticulture offre de l’emploi pour quelques milliers d’ouvriers venus un peu partout en dehors de cette région. Ils s’installent définitivement ici, s’ils le veulent seuls ou avec leurs familles. Certains d’entre eux se sont devenus les propriétaires de leurs propres exploitations et arrivent même à produire des produits biologiques à haute valeur ajoutée (datte en particulier) et à signer des cahiers de charges avec des organismes certificateurs pour leur vendre ces produits.

Les Résultats les plus Significatifs

La préoccupation majeure des pouvoirs publics est l’amélioration des revenus des agriculteurs, la réduction de la pauvreté et la création d’emplois. Cette volonté s’est traduite par la conception et la mise en œuvre des projets de proximité de développement rural (PPDR) préconisées par le ministère de l’agriculture et du développement rural dans le plan national de développement rural (PNDR). S’ajoute à cela la subvention accordée pour la construction et l’entretien du logement en milieu rural et l’ouverture de pistes rurales.

Facteurs Contribuant aux Succès et Échecs

Problèmes Rencontre et Solutions Trouvées quand la Pratique a été Réalisée,

Parmi les problèmes rencontrés lors de l’adoption de la plasticulture en région aride on peut citer : La pauvreté du sol en éléments minéraux, la salinité de l’eau, la température élevée de l’eau souterraine, la remontée de sel, les vents violents, insectes et ravageurs de plantes, le changement de métier des fils d’agriculteurs, etc.

Concernant les solutions trouvés afin de remédier à ces problèmes, on note: Pour la pauvreté du sol désertique, deux solutions ont été préconiser par les exploitants, à savoir l’apport d’importantes quantités de fumures organiques et minérales (plus de 5 tonnes de fumier et plus de deux quintaux d’engrais par serre) et la pratique d’une plasticulture itinérante qui consiste à déplacer les serres quand le sol est épuisé pour s’installer dans un endroit non utilisé auparavant.
En ce qui concerne la nature chaude et saline de l’eau souterraine, les exploitants font tourner l’eau chaude dans des rigoles ouvertes pour ramener la température de l’eau à la normale et pour faire face à la salinité de l’eau, ils préfèrent tabler sur le choix des cultures et des variétés résistantes à la salinité. Pour la remontée de sel, ils pratiquent la rotation des cultures et l’assolement. Les champs non clôturés des plasticulteurs offrent des occasions annuelles pour les vents violents de détruire les serres installées sans grand renfort, sans pour autant choisir les serres de qualité avec armature solide, films plastiques rigides et attachement consistant.

Pour les insectes et les ravageurs, les exploitants utilisent une panoplie complète de produits phytosanitaires qui l’utilisent aussi pour réduire l’importante quantité de gouttelettes d’eau qui se forment sur le film plastique pour tomber ensuite au dessus des plantes et causer des dégâts non négligeables. Les produits phytosanitaires sont distribués, en général, par des agents non connaisseurs. Malgré cela, les plasticulteurs ne font pas appel aux cadres de l’Institut national de la protection des végétaux (INPV) et ceux de l’institut technique pour le développement de l’agriculture saharienne (ITDAS) qui n’ont pas montré preuve de leur compétence.

Finalement, pour lutter contre la fuite des fils d’agriculteurs vers les secteurs les plus rémunérateurs, les exploitants font appel à la main d’œuvre salariée et qualifiée permanente et saisonnière.

Quels Ont été les Leviers ayant Permis le Changement,
En plus de la rentabilité financière des capitaux engagés dans cette spéculation, l’ambition et l’attachement à la terre des paysans est un autre levier important qui a poussé ces derniers à investir davantage dans la terre des ancêtres. Un autre levier non moins important réside dans le retrait définitif des pouvoirs publics dans la régulation et le contrôle des marchés de gros des fruits et légumes.

Principales Raisons ayant Contribué au Succès

Plus Interne
La première raison est le courage dans la prise des décisions et les risques encourus lors de la découverte d’une nouvelle technique agricole inconnue pour leurs ascendants. Les plasticulteurs n’ont pas subi aucune formation. Les innovations paysannes ne sont pas ici rares. La recherche agronomique à travers les instituts d’enseignement supérieur et de recherches scientifiques ne leur proposent rien et la vulgarisation agricole reste en dessous de leurs attentes. C’est au paysan d’innover ses propres méthodes ou copier et imiter se qui se passe chez son voisin ou bien chez un autre paysan d’une autre région ou bien encore adopter les itinéraires techniques proposés par les ouvriers venus du nord du pays là où ils ont côtoyé les colons.

Concernant les capacités spécifiques nécessaires pour la conduite de cette pratique, il est à noter que l’état actuel du marché qui absorbe la totalité de la production en l’absence d’organisme de contrôle et de protection du consommateur et de l’environnement, fait en sorte que cette pratique n’exige qu’une parcelle de terre avec de l’eau et équipée en électricité pour faire fonctionner les pompes.

Organisations ou Champions qui ont été Déterminants pour le Succès
L'État, afin de marquer sa présence dans tous les domaines, encourage le regroupement des agriculteurs dans des associations pour pouvoir défendre leurs intérêts. Une association de ce genre existe et regroupe les plasticulteurs de la région. Mais vite dès que les exploitants comprennent qu’il s’agit de politique, ils laissent tomber cette affaire. Le succès ne revient pas à cette association mais plutôt à la pratique elle même qui fait que le producteur primeuriste arrive le premier sur le marché et peut vendre sa production à des prix rémunérateurs. La majorité des plasticulteurs n’ont aucune idée sur l’existence d’une telle association que se préoccupent de leurs intérêts.

Local ou Raisons Externes
Du point de vue social, la fonction social de la plasticulture est primordiale dans la mesure où elle permet de sauvegarder les relations sociales existantes et de créer de nouveaux réseaux de communications entre les générations d’agriculteurs au moment où ces derniers commencent à perdre leur substance principale en l’occurrence leur progéniture qui fuit l’agriculture et le milieu rural. De ce point de vue, la plasticulture vient renforcer le rôle social de la phoeniciculture et donner une nouvelle dynamique à l’environnement socio-économique de l’agriculture en général.

Si la lutte contre la déprise en milieu rural européen était des objectif de la politique agri-environnementale européenne, on peut dire que cet objectif est atteint ici par la pratique de la plasticulture. Mais si on considère que le rabattement de la nappe phréatique et l’épuisement des eaux fossiles de la nappe profonde et la dégradation du sol par le phénomène de remontée de sel du à l’irrigation, on peut dire cette fois-ci que la plasticulture porte atteinte à l’environnement en l’absence de solutions techniques.

Le renouveau de l’agriculture vient de la part des phoeniciculteurs qui commencent de plus en plus à produire des dattes biologiques exportées vers l’Europe. On est dans l’incapacité de confirmer cette tendance pour les plasticulteurs par manque de recherches là-dessus.

Les conflits au sein des communautés ne manquent pas. Il existe une sorte de concurrence entre les agriculteurs du Ziban est et ceux du Ziban ouest. En effet ces derniers, arabophones, ont le privilège d’avoir les plus belles palmeraies du pays qui produisent la noble variété de datte "Deglet Nour", en plus ils ont l’habitude d’élever des ovins. Par contre, chez les agriculteurs du Ziban est, berbérophones, le palmier dattier ne pousse pas ce qui donne lieu à cultiver davantage le maraîchage en plein champs et par conséquent une plus grande pression sur l’eau et le sol. Ce conflit invisible se manifeste par la concurrence entre les deux marchés de gros, à savoir, le marché de M’ziraâ à l’est et le marché d’El-Grous à l’ouest.

Politiquement parlant, la fixation des population rurales dans leur milieu constitue un intérêt non négligeable. Pour cette raison, la classe dirigeante mène depuis quelques années une politique d’aide à la construction et à l’entretien du logement où la moitié du budget est consacrée au profit des habitants du milieu rural. L’intérêt politique vise aussi l’amélioration du niveau de vie de la population toute entière par l’incitation à la production à tel point où les prix des denrées alimentaires baissent pour encourager la consommation.

Conditions plus Globales
Plus globalement, les conditions de développement de l’agriculture algérienne depuis l’indépendance et même durant la période coloniale étaient moins favorables pour le secteur privé, dit traditionnel, qui se caractérise, entre autre, par une taille réduite de ses exploitations localisées dans des zones de montagnes difficilement accessibles avec des sols pauvres et des équipements archaïques et sans possibilités de crédits bancaires ou de subventions. Les politiques agricoles antérieures ont favorisé le secteur publique de production sur tous les plans. Les résultats de ces politiques étaient décevants en terme de rendement physique, de rentabilité économique et de production en nette régression et loin d’arriver à concrétiser l’objectif ultime des élites dirigeantes, en l’occurrence, l’autosuffisance alimentaire du pays. En revanche, le secteur traditionnel était plus performant sauf qu’il a perdu sa jeune composante sociale qui a été attirer par les possibilités de recrutement qu’offrait la ville avec ses industries et ses besoins en main d’œuvre.

La faiblesse de la production du secteur publique accentuée par la mobilité de la population du secteur privé et la croissance démographique globale, qui était parmi les plus élevée au monde, ont donné un coup de chance pour ce qui reste du secteur privé qui n’a pas raté l’occasion pour s’enrichir en produisant davantage et en contrôlant le marché.

Concernant le soutien approprié des institutions nationales, il faut noter qu’à partir de l’an 2000 et à travers le programme national du développement agricole (PNDA), l’Etat algérien a donné un important coup de main qui a soulagé le secteur agricole par l’encouragement d’investissement dans l’agriculture et l’agroalimentaire à travers les possibilités de subvention et de crédits bancaires. Toutes les institutions publiques administratives ( Directions des services agricoles…), financières (Banque de l’agriculture et du Développement Rural, Caisse Nationale de Mutualité Agricole) et scientifiques (Institut National de Recherche Agronomique d’Algérie) sont impliquées dans la mise en œuvre de cet ambitieux programme.

L’environnement macro-économique est favorable avec une demande solvable d’un marché non saturé et non exigeant. Les prix pour les primeurs sont rémunérateurs. Les consommations intermédiaires sont disponibles et diversifiées et leurs coûts sont abordables et à la portée de tous les exploitants. Cependant, les crédits de campagne font défaut et ne sont tangibles que rarement et tardivement. Les possibilités d’exportation, notamment vers les pays de l’Afrique Subsaharienne, et de transformation et de stockage existent.

**Opportunités pour la Généralisation de cette Pratique**

**Possibilité de Généralisation au Reste du Pays**

La généralisation marquera son succès dans cette même région si on arrive à baisser la salinité de l’eau qui empêche la conduite des cultures moins résistantes à la salinité.

Ensuite l’extrapolation est très possible surtout dans les régions limitrophes qui possèdent les mêmes caractéristiques bioclimatiques et les mêmes composantes socioéconomiques à condition de garantir des débouchés certains, soit par le marché, ou bien par la demande des agro-industriels ou bien encore par l’exportation.

**Les Risques Associés à la Généralisation**
La généralisation de la pratique de la plasticulture est un bon remède pour subvenir aux besoins d’amélioration des revenus des pauvres agriculteurs et d’encouragement de la consommation, mais qui risque de faire chuter les prix et par conséquent le taux de profit des plasticulteurs.

Que Doit on Faire pour Promouvoir cette Pratique

• Premièrement, et avant tout il faut mettre fin aux spéculations que mènent une multitude d’intermédiaires commerciaux qui s’accaparent du gros lot de la valeur ajoutée de la production et des marges bénéficiaires sur les inputs empêchant ainsi le producteur de s’enrichir et le consommateur de réduire ses dépenses tout en mangeant convenablement, ceci est possible par l’organisation des marchés de gros ;

• Deuxièmement, améliorer la qualité de l’eau utilisée par un système de refroidissement des eaux chaudes et le dessalement des eaux saumâtres ;

• Troisièmement, afin d’améliorer le revenu des petits et moyens paysans et attirer d’autres couches sociales citadines à investir, il faut leur proposer, entre autre, des serres multi-chapelles introuvables jusqu’aujourd’hui sur le marché national afin qu’ils cultivent plus, produire davantage et empochent mieux ;

• Quatrièmement, il faut mener des campagnes d’expérimentation, de sensibilisation, de vulgarisation de nouvelles techniques, méthodes et moyens de production dans l’objectif d’améliorer les conditions techniques de la production et de convaincre ceux qui hésitent à son adoption sous prétexte de non maîtrise du processus de production.

• Cinquièmement, la signature d’un cahiers des charges par l’agriculteur d’une part et par l’industriel ou l’exportateur d’autre part, constitue une condition sine qua non pour la promotion de cette pratique où le producteur peut donner son meilleur et l’acheteur être certain de récupérer ses marchandises. Sans cette procédure, les prix resteront instables et variables, pour les tomates par exemple, entre 120 DA le kg au début de la récolte et 5 DA vers la fin de la campagne agricole.

• Sixièmement, faire en sorte de disposer des crédits de campagne, au cas où, la pompe tombe en panne qui est une chose très fréquente, ou à l’occasion des ravages naturels, le cultivateur se trouve dans l’aisance et la possibilité de faire face immédiatement et ne pas perdre une partie ou la totalité de sa production.

• Finalement, le développement des conditions du stockage, du transport et de la transformation des légumes frais sera la plaque tournante des plasticulteurs, ses effets externes positifs dépasseront les frontières de plusieurs régions.

Références


Ministère de l’agriculture et du développement rural : séries statistiques A et B

Statistiques de la Direction des Services Agricoles de la wilaya de Biskra ;

**Title of practice:** The itinerant greenhouse development in Ziban

**Country and region where developed:** the Ziban area (south-eastern of Algeria)

**Authors of this case:** Bennoui Foudil

**Category of Production:** Early-season market gardening under plasticc.

For its context and genesis, it would be important to know:

**Brief description of the production or service system**

We found, in the area of Ziban, several agricultural systems of production, of which at least two among them are dominant. The first is a system of production which is based on the extensive sheep husbandry where water is scarce. The second is an oasis farming system which is characterized by the importance attached by the owners to date palms and more particularly to the variety "Deglet Nour" intended for export. This system is associated with traditional sheep and goat husbandry with very reduced manpower. However, during the past twenty years the systems of production in this area underwent major modification due to the introduction of greenhouses the utilization of underground water. The results of this revival led to the Wilaya of Biskra located in the south of Algeria being the first in relation to the number of greenhouses: towards the end of the year 2004 more than 50,000 greenhouses. The advantages of this system reside in its financial profitability initially, and bioclimatic conditions and landscape in the second place, but also the availability of underground water and the barrage and the labour force who come particularly from the north of the country.

**Brief description of social, economic and institutional context**

Social, economic and institutional contexts in Ziban, are favourable. Socially, they will maximize the profit of the farmers associated with their deep attachment with the grounds make the source of motivation of the latter. Economically, the demographic growth in more of the retreat of poverty made, in kind, that the request on the products early vegetables is in cease increase. The new economic context characterized by the opening of the national economy on international one, allows a provisioning broad and diversified greenhouse farmers of inputs necessary to the production process. The institutional context is favourable since one attends a declared will of the public power which encourages to invest in agriculture and regards the agricultural sector as priority.

**Problem/issue to be tackled:**

The crisis of the Algerian agriculture is characterized by its incapacity to nourish the population and no manage to produce sufficient products known as strategic (cereals, milk...), was at the origin of the adoption of a policy of development and reconversion of the unproductive farming systems in arid areas. Moreover, we can’t neglect the crisis of the unemployment which touches the working population especially young persons.

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1 IFAD case study.
2 Economics Department, Mohamed Khider University Biskra, Algeria.
Organizations and stakeholders
The Ministry of Agriculture and the rural development, in response at the request of the farmers resulting from their own experiments.

To describe the Practice

Specific description of the innovations or changes introduced (what was done):
At the beginning of the 1980’s greenhouses were non-existent in this area and the market-garden production was not common and failed to satisfy the local demand. Currently, the production of this area represents, according to official data, 33 % of the market-gardening production of all Algeria.

Main activities :
The vegetable production of this area remains until now without the realization of important stages of development, because it is limited to deliver to the market fresh products without undergoing transformations and far from fulfilling the requirements of export in terms of respect of the standards of quality, quantity and the times required by the actors of the international market.

Resources
The setting in, over, the year 2000, the National Program of the Agricultural Development (PNDA), which aims, amongst other things, the durable increase in outputs, natural resource and environmental protection, but also improvement of the incomes of the farmers. The budgetary contest public was about 200 billion DA, that is to say 2,7 billion dollars US. The resources used, for the extension of this practice, are public resources essentially in the form of subsidy since last year 2000 and of bank credit in more of the self-financing of the farmers.

Main stakeholders
The main actor is undoubtedly the farmer who profited from a structure of financing distributed between subsidy (50 %), bank credit (20 %) and self-financing (30 %). The other actor is the contractor who carries out the construction of the basins of accumulation and drillings. The companies specialized in the production of the hydraulic equipment as well as the retailers of pumps, of heads of stations, as pursuers and canals irrigation were of their share strongly implied. The supplier in reinforcements of greenhouses, plastic films, and manure and especially of seeds is an actor impossible to circumvent. The importer of installation for cold room strongly contributed in the realization of these projects. It should be noted, however, that the framing of the agricultural activity and in particular the follow-up of the projects of investment are under the responsibility for the autonomous office of the agricultural engineer. This shape of framing is conceived for the first time with an aim of creating stations of employment for this category without much of chance to be to recruit. The commercial intermediaries of all kinds, lover and downstream, collect the main part of the added value and the profit margins thus preventing the producer and the consumer to drip suitably the fruit of this practice.

Main intended target groups
In term of subsidy, the principal profit groups are the farmers. In term of financial intermediary, are their financial and insurers. As a lover of the greenhouse farmer are all the companies of
manufacture of tools and supplies, of importation of seeds and materials, distribution and resale. Downstream, are the commercial intermediaries, which control the market in fruit and vegetables, the unemployed executives, which were occupied, agro alimentary industries that intervene in convenient time to collect all the production at very low price at the end of the campaign and the citizen who consumes more and more fresh products.

**Assessment and impact**

*Why was it considered successful*

The success of this practice lies in the capacity of the market to absorb all the production. The climate of the area is favourable to the cultures early product, the subsoil water is abundant and the labour force over too.

*Evaluation of benefits (quantitative and qualitative) for stakeholders*

For greenhouse plants of this area, the mode to put forward indirectly dominates. It is a question of recruiting unemployed young people for more than 90% of the cases or many whole families all, where women, girls and children, take part in the agricultural work. If the owner has a significant number of greenhouses, the procedure in this case is to recruit several workmen, generally, three greenhouses for each workmen or family of workmen. The unit value of the sales is, generally, variable between $14.10^4$ and $20.10^4$ DA (Dinar Algérien), which gives a net benefit higher than $10^5$ DA per greenhouse. One third of this sum is allocated to the workman, i.e. a minimum of $33333$ DA per greenhouse. The average income of the workmen is of $10^4$ DA is generally equaled by three greenhouses, that is to say a monthly income of $10^4$ DA. This income is equal to the minimum national wages guarantee.

*Most significant impacts in terms of poverty alleviation, food security and poor people’s livelihoods?*

The greenhouses offer employment for a few thousands of workmen coming from within and outside this area. Some of them become the owners of their own farms and even managed to produce agricultural produce with high added value (dates in particular). Others preferd to rent directly on their own account plots of land equipped with greenhouses and water.

*Significant outcomes influencing institutional changes for poor people?*

The major concern of the authorities is the improvement of the incomes of the farmers, the reduction of poverty and the creation of jobs. This resulted in the design and the set up of proximity rural development projects (PPDR) recommended by the Ministry of Agriculture and Rural Development in the National Plan of Rural Development (PNDR).

**Factors to be understood contributing to successes and failures**

*Problems encountered and solutions in implementing the practice*

Among the problems encountered at the time of the adoption of greenhouse plant in arid areas one can quote: soil infertility because of bioorganic salts, the salinity of water, the high temperature of subsoil water, salt increase, the violent winds and the change of employment of farmers’ sons. To solve these problems, one notes, for example, the infertility of desert soils, two solutions were recommend by the owners, namely the contribution of large quantities of organic and mineral manures and the practice of an itinerant greenhouse plant which consists in moving
the greenhouses when the ground is exhausted to settle in a place not used before. Concerning the hot nature and salinity of subsoil water, the farmers cool hot water in open drains and to resolve the salinity of water they count on the choice of the crops and varieties which are resistant to salinity. In order to manage the salt increase, they practise crop rotation. Finally, to fight against the loss of labour towards the remunerative sectors, the farmers pay labour adequately and also employ qualified permanent and seasonal workers.

Key driving forces in managing change
In more of the financial profitability of the capital engaged in this speculation, the ambition and the deep relationship between the peasants and the land are another important lever which encourage them to invest more in the ancestor’s ground.

Main reasons for success (or failures)
More internal, e.g.: how were activities undertaken, such as types of training, specific methodologies used, specific skills required to implement them (new/additional resources): The first reason is courage in treating the decision and the risks incurred at the time of discovered of a new unknown agricultural technique for their ascending. The greenhouse farmers did not undergo any formation, that is, it is to the peasant to innovate his own methods. Concerning the specific capacities necessary for the conduit of this practice, it should be noted that the current state of the market which absorbs the totality of the production makes so that this practice does not require land plot with water and equipped in electricity to make function the pumps.

Organizations and champions who were essential to its success (what was special about them): The State, in order to mark its presence in all the fields, encourages the regrouping of the farmers in associations to be able to defend their interests. An association of this kind exists and gathers the greenhouse farmers of the area. The majority of the greenhouse farmers do not have any idea on the existence of such an association that interests them.

Local, more external conditions: social and environmental, e.g. community conflict, local political interests, etc…: From the social point of view, the function social of greenhouse plants is of primary importance in so far as it makes it possible to safeguard the existing social relations and to create new networks of communications between the generations of farmers at the time when the latter start to lose their principal substance in fact their offspring who flees agriculture and the rural medium. From this point of view, the greenhouse plants gives a new dynamics to the socio-economic environment of agriculture. If the greenhouse plant is considered that the lowering of the pyretic water table and the fossil dewatering of the deep tablecloth and the impoverishment of the soil by the phenomenon of salt increase of to the irrigation, one can say this time that the greenhouse plants undermines the environment in the absence of technical solutions. Politically speaking, the fixing of the population rural in their medium constitutes a considerable interest. For this reason, the leading class has followed for a few years a policy of assistance to the construction and the maintenance of housing where half of the budget is devoted to the profit of the inhabitants of the rural medium.

Wider context/conditions: unfavourable policies, suitable national level support institutions, macro-economic environment, etc…: Environment overall, the conditions of development of Algerian agriculture since the independence and even during the colonial period were less favourable for the private sector, known as traditional. The former agricultural policies supported
the public sector of production on all the plans. The results of these policies were disappointing in physical term of output, economic and financial profitability and production in clear regression and far from managing to concretize the ultimate objective of the leading elites, in fact, the food self-sufficiency of the country. Concerning the suitable support of the national institutions, it should be noted that as from the year 2000 and through the national program of the agricultural development (PNDA), the Algerian State give an important blow of hand which relieved the agricultural sector by the encouragement of investment in agriculture and the agro alimentary one through the possibilities of subsidy and bank credits. All the administrative public institutions, financial and scientists are implied in the setting in over of this ambitious program. The macro-economic environment is favourable with a solvent request for a market unsaturated and non-demanding. The prices for early products are remunerative. However, the appropriations of countryside are missing and are tangible only seldom and tardily.

Opportunities for mainstreaming and scaling-up

Suitability for scaling up to others in rest of country, or for extrapolating to other countries? In general the practice will be successful in the same area if one manages to lower the salinity of the water which prevents the control of the cultures less resistant to salinity. Then extrapolation is possible, especially in the bordering areas which have the same bioclimatic characteristics and the same socio-economic components with the proviso of guaranteeing outlets, that is to say the markets, or by order of agro-industrial enterprise or even of exporter.

What are the risks associated with scaling up (ie flooding markets from over production)? Generally the practice of greenhouse planting is a good remedy for the improvement of the incomes of the poor farmers and for encouraging consumption.

What has to be done to promote it elsewhere successfully? Firstly, it is necessary to put an end to the speculations of commercial intermediaries which take the major part of the value added of the production and in addition profit on the inputs thus preventing the producer from a major part of the benefits. Similarly, the consumer reduces his expenditure while eating healthily, made possible by the organization of the wholesale markets. Secondly, to improve the quality of water by a system involving the cooling of hot water and the desalination of brackish water. Thirdly, in order to improve the income of small and average peasants and to attract other town social layers to invest, it is necessary to promote efficient multi-vault greenhouses, until today not available on the national market, so that they produce more and generate more profits. Fourthly, it is necessary to conduct research and extension campaigns of experimentation, sensitizing, popularization of new techniques, methods and means of production with the objective of improving the production conditions and of convincing those who hesitate to adopt because of the lack of control of the production process. Fifthly, the signature of schedules of production conditions by the farmer on the one hand and the industrialist or the exporter on the other hand, constitutes an indispensable condition for the promotion of this contracting practice. Without this procedure, the prices will remain unstable and variable: for tomato for example, between 120 DA kg at the beginning of harvesting and 5 DA towards the end of the crop year. Sixthly, to ensure adequate agricultural services including repair services to reduce production risks, e.g., if the pump breaks down, or from climatic disasters.
References

No study or publication of this kind, to my knowledge, was made on greenhouse plant in the area of Ziban. The only chance to find documentation, in my opinion, is to go to seek memories of end of studies on the level of the department of rural economy of the agronomic national institute of Algiers or that of Blida;

Marc Cote. "Des oasis aux zones de mise en valeur: l’étonant renouveau de l’agriculture dans le Sahara maghrébin" presentation submitted at the international seminar on: "Le développement de l’agriculture saharienne comme alternative aux ressources épuisables" university of Biskra of the 22 to the 23/10/2002;

Ministry for agriculture and the rural development: statistical series A and B;

Statistics of the Management of the Agricultural Services of the wilaya of Biskra.

What type of information and assessment on impacts and on factors for success is available? e.g. independent evaluations, project report, anecdotes, etc.

S. Bedrani, F Chehat and S. Ababsa. " l’agriculture algérienne en 2000. une révolution tranquille. Le PNDA "in Prospective n°1, 2001, p-p. 5-60;

S. Ababsa; " L’agriculture algérienne : l’ère des progrès en attente de consolidation et de généralisation " in le Quotidien d’Oran of the 25 to the 27/07/2004.
Title of Best Practice: Sustainable Tree Crops Program: a Public-Private Partnership Realizing a New Development Paradigm\(^9\)

Country: West and Central Africa

Authors: Martine Ngobo and Stephan Weise\(^10\)

Category of Practice: Public-private partnership

Context and Genesis

A three-year regional action plan was initiated at a workshop in November 2002 in Accra, Ghana. This included a series of pilot programs building on detailed baseline surveys that were conducted across the region in 2001. The goal of STCP is to improve the economic and social well-being of smallholders and the environmental sustainability of tree crop farms of West and Central Africa. To achieve its goal of improving the economic and social well being of smallholding farmers, the STCP Development Alliance has been focusing its resources and support on:

- Research and technology support to promote environmentally sustainable farming, and improve farmer incomes. In this component, the main activities undertaken include: (i) development of a curriculum for ICPM on cocoa systems and FFS manuals (English and French versions); (ii) over 200 farmer field schools were run and a rigorous monitoring plan implemented;
- Strengthening farmer and community organizations and the private sector: this is being achieved through SOCODEVI who provides a regional technical support.
- Trade and information systems to improve farmer income, and product quality: a technical support is being provided to grouped marketing and associated strategies of timing, volume and direct sale. Linkages are being developed with ICCO projects to enhance marketing and market and information systems in Cameroon, Côte d’Ivoire and Nigeria. In Cameroon, Ghana and Nigeria, GIS-referenced production information system is being pursued for cocoa systems.
- Social systems that promote responsible labor practices and government delivery of social services; and
- Policy change to increase the efficiency of the tree crop sector.

Pilot programs supported by regional expertise are now being implemented in a strategic and integrated manner in Cameroon, Côte d’Ivoire, Ghana, Guinea and Nigeria by local and international non-governmental organizations, farmer organizations, local governments and civil society organizations. The primary entry point in Cameroon, Côte d’Ivoire, Ghana and Nigeria has been the cocoa sector, while in Guinea it is cashew.

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\(^9\) IFAD Supported Case Study

\(^10\) International Institute of Tropical Agriculture-Humid Forest Ecoregional Center. Yaoundé, Cameroon.
STCP is managed through the International Institute of Tropical Agriculture, and is programmatically guided by country-level national tree crop networks and a regional multi-stakeholder steering committee.

The introduced innovations of the program include:
1. Regional approach to cocoa production, marketing and research
2. National networks and strategic alliances allowing for communication between regional and national partners and across stakeholders
3. Farmer organizations linking production with the supply chain, and providing a conduit for the transfer of knowledge and technologies
4. Linking social messages with technical ones (child labour and HIV/AIDS)
5. Participatory approaches building the skills of farmers, e.g. Field Schools and Field Research

**Program Pilot Phase Achievements**

The Sustainable Tree Crops Program (STCP) was implemented through four primary components during the Pilot Phase (Oct. 2002 – Sep. 2005). Achievements to date are summarized below.

**Technology and Knowledge Dissemination**

STCP has identified effective strategies building on the Farmer Field School approach to address integrated cocoa crop and pest management with relevant curricula and materials prepared, 139 trainers trained to date, field schools conducted training over 8,500 farmers, and impact being monitored and evaluated. Assisted farmer-to-farmer diffusion of knowledge is reaching an additional 17,000 farmers. This participatory training approach covers around 15 field school sessions through a whole cocoa cropping cycle. It encourages farmers to make their own discoveries about management practices, to reduce their dependence on costly inputs such as pesticides, and to improve their understanding of crop and pest interactions, thus allowing them to make sound production decisions. For example, field school plots produced over 30% more pods in Ghana and Cote d’Ivoire and reduced pesticide use in Nigeria and Cameroon by 10-20%. The main practices adopted are pruning, shade management and sanitary harvests. In addition, farmer field research on pest management (i.e. on black pod disease and capsid) and rational use of pesticides is being implemented to enhance further learning by farmers in collaboration with researchers. Demonstration plots and associated nurseries have been established for the rehabilitation of exiting cocoa farms and the establishment of new farms on fallow land. To secure the sustainability of these efforts, the program is engaging and training both private and public institutions (i.e. farmer organizations and public extension). In addition, research on new solutions for key production constraints are being supported by STCP, i.e. the biological control of black pod disease, the characterization of the genetic diversity of cocoa germplasm, and the new establishment/rehabilitation of diversified cocoa agroforests.

**Grower and Business Support Services**

STCP is strengthening through training and technical support 15 cooperative-like structures reaching over 31,000 farmers directly in the four cocoa growing countries. Building on a detailed needs’ assessment conducted at the start, significant efforts have gone into moving these farmer organizations gradually towards becoming viable farmer-owned enterprises that efficiently market cocoa and supply their members with necessary production inputs. For example in
Cameroon, farmer organizations have developed a common vision towards becoming more entrepreneurial and transparent, and are now aligning themselves with 3 marketing cooperatives. In Nigeria, the Tonikoko Farmers Union has officially evolved into a cooperative union, hiring a manager and opening a Trade and Information Center. While continuing to strengthen eight base cooperatives in Côte d’Ivoire, a union of cooperatives has been established with the goal of greater access to finances and markets. With the goal to rapidly scale up the lessons through national institutions, a systematic training framework addressing good governance, financial management, and client service orientation is being developed. It will allow farmer organizations to evolve in manageable stages (i.e. taking on additional service responsibilities in tandem with the development of the necessary organizational capacity and capability). In addition, the program is assessing the need for sustainable structures that integrate across individual farmer organizations to allow for economies-of-scale and for “umbrella” organizations to play a greater market-defining role.

Marketing and Information Systems
This component of STCP is closely linked with the one above, which has been focusing on the strengthening of farmer organizations. The premise is that farmers who are organized effectively will be able to better engage with markets. By shortening the supply chain and increasing the transparency of transactions, they will be able to accrue some of the margins for their members. The primary focus of STCP to date has been on increasing efficiencies in-country linked to the specific pilot farmer organizations. Different marketing strategies (e.g. grouped auctions, negotiated sales to buying agents, exporters, or processors) are being tested in the four cocoa countries based on local opportunities and within the national policy environments. These efforts have already led to farmers receiving 5-15% better farm-gate prices for their cocoa. The development of appropriate market information and quality control systems is an integral part of this strategy. This is most advanced in Côte d’Ivoire where a software has been adapted to the needs of the cooperatives to facilitate accounting, monitoring of sales, and inventory control. Overall, this has led to greater confidence of farmers in their cooperatives and to cooperatives being able to access private sector funds to finance cocoa marketing. In addition, production based information systems are being tested for their value in both better management of the production base, as well as to enhance marketing, particularly where specific product characteristics are sought.

Social Issues
Baseline surveys indicated that children may be exposed to hazardous forms of child labour while helping on cocoa farms. The role of STCP has been to integrate social messages (primarily on child labour and HIV/AIDS) into its capacity development efforts within the other components in conjunction with, and complementing, other specialized programs like those of ILO/WACAP and the International Cocoa Initiative. This has been particularly successfully done within the Farmer Field School curriculum and the strengthening of farmer organization activities. Just through the Farmer Field Schools, over 7,000 farmers have been sensitized on hazardous forms of child labour to date. Follow-up studies are showing that about 70% of the farmers have a good understanding of the issues, which would indicate that around 20,000 children are benefiting from this effort.

Program Assessment and Impact
An External Review of STCP in February, 2005 focusing on the cocoa activities emphasizes that “STCP's most important accomplishment and innovation is the public-private partnership and its holistic approach to address complex challenges and issues that is its raison d'être, and from which all stakeholders derive value. This unique partnership has never before existed for the cocoa sector, which is the most important tree-based commodity in West Africa. The public-private partnerships foster collaboration between institutions, organizations and enterprises, who share the common vision of improving the livelihoods of smallholder tree crop farmers, while ensuring a sustained and robust supply of quality tree crop products. The flexibility of this innovation platform of public-private partners allows the different groups to work together based on a common understanding of the complementary roles, while being able to achieve their individual goals more effectively. As the Pilot Phase winds down, STCP has been asked by the its Development Alliance to develop a five-year plan building on its successes to date and integrating broadly with national and regional agricultural development efforts.

Testimony
Olori Ronke Akindoju, Bamikemo, Ondo State (Nigeria): “I think better days are here for the cocoa farmers of Nigeria. God has answered our prayers and our labor will yield plenty of returns again. This is why the farmer field schools have come.”

Program Challenges

STCP seeks to build on its Pilot Phase experience by identifying complementary methods and adapting messages in order to reach as many farmers as possible. At the same time, STCP is engaged with private and public institutions, which can contribute substantially to securing the sustainability of the Farmer Field School and associated approaches.

The strategy used in the Technology/Knowledge Dissemination component has in itself become a model for the strategy pursued by STCP during the Pilot Phase for the other components, i.e. where an innovation is tested, its impact assessed, and the institutional conditions for scaling up are identified. STCP is now in a position to be able to consider alternative approaches to Farmer Field Schools.

Furthermore, the focus to date has been primarily on cocoa with very little effort on diversification. Activities in this respect are being initiated and but will not come to fruition by the end of the Pilot Phase. Supportive research on germplasm identification and multiplication, the development of model multi-species agroforestry systems, and the payment for environmental services linked to collaborating farmers will need to continue.

The extent of progress in the Technology/Knowledge Dissemination component has not yet mirrored in the Strengthening of Farmer/Community Organization and Marketing and Information Systems components. The Strengthening of Farmer/Community Organization component has seen important efforts in all four countries, activities being adapted to the specific circumstances based on an assessment of needs conducted by SOCODEVI in the second half of 2003. Currently, STCP does not have lessons-learnt for the development of a unified step-wise approach that could be used as a broader template for rapid scaling up and out. Although the
Program has some elements in place, it must develop an overarching approach that allows farmer organizations to evolve in stages (depending on their strength and status) with the support of national institutions in order to become viable enterprises. In addition, STCP will need to focus its effort more strongly on structures that integrate across individual farmer organizations to allow for economies-of-scale and for “umbrella” organizations to play a greater market-defining role.

Although a part of the Trade and Information System Project, the program has not been able to make any progress to date on differentiation and preservation of identity. As relationships with the above-mentioned “umbrella” organizations are established, STCP will need to re-focus its marketing and information system efforts at that upper level, which should also allow for new financing and marketing opportunities to be exploited building on economies-of-scale.

STCP guiding principles throughout its Pilot Phase were:

- Testing of innovative development options and approaches (production, institutional, market)
- Assessing the process, impact, and conditions for success
- Sustainability and institutionalization of innovations
- Integrating lessons into national development efforts (for cost effective scaling up)
- Country and regional understanding, deep knowledge of development and networks of expertise, financing capacity;
- Private Sector: Market discipline, integrated technologies, specific knowledge of industry, skills and experience to better design market focused activities; and
- Ensure that priority needs of the farmers are addressed, willing to contribute directly as benefits become evident.

Program Mainstreaming and Scaling-up

Since March 2005, a consultative process has been put in place to inform key national and regional tree crop stakeholders of the progress the Sustainable Tree Crops Program (STCP) has made to date and identify what role STCP should be playing in the future to support national and regional development efforts in the sector. The programmatic outlook presented in this note builds on some of the consultations to date and emerging outcomes of the STCP Pilot Phase.

STCP will remain an “Innovation Platform of Public-Private Partners” – sharing experiences, supporting scaling up, and complementing each other within a common vision.

Five key ingredients are seen as being necessary to successfully facilitate a scaling up effort:

- Robust, tested and validated production, market, and institutional innovations
- Conducive policy environment for a productive tree crop sector
- Local support of governments and business partners
- Effective local delivery mechanisms
- Adequate resources.

Robust production, market and institutional innovations need to be available with the associated impact information from the Pilot Phase. At the same time, policy constraints need to be
identified and solutions presented and discussed at national, regional, and international fora towards creating the necessary policy environment and partnerships for broad-based uptake of promising innovations. Local, national and international development institutions as well as local and national authorities need to be actively engaged in partnerships to support the scaling up and out of these innovations. Local institutional capacity (public and private) responsible for scaling up of innovation sets need to be identified, the training structure and process need to be worked out, and training material made available. To allow this scaling up to take place, sets of innovations will need to be integrated into national development plans with the participation of both the private sector as well as public institutions. Active support of national, regional, and international financial institutions and donor organizations will be necessary.

Another aspect of scaling up is the expansion into new countries. These countries will develop together with STCP pilot areas for adapting STCP-tested innovations to the specific social, economic and institutional environment and building the necessary institutional skills.

Following innovations are already showing promise and should lend themselves for an early scaling up effort:

- Farmer Field School approach for cocoa integrated crop and pest management, includes tools for training farmers and trainers.
- Training of farmer organizations in business/reinvestment practices and marketing of products, using a framework that allows growth in manageable steps.
- Cocoa quality control and information systems at the cooperative level.
- Marketing of cocoa by organized farmers. This includes grouped marketing through auctions organized by farmer associations and direct sales to buying agents, processors, and exporters.
Title of Best Practice: Soil and water conservation practices and improved livestock farming systems for sustainable agriculture and food security achievement in the semi-arid region of Burkina Faso.

Country: Region of Central Plateau, Burkina Faso.

Authors: Jean Sibiri Zoundi and Robert Zougmoré

Category of Practice: Integrated crop-livestock farming systems a challenge for sustainable agriculture development in uncertain environments

Context and Genesis

The northern region of Burkina Faso is characterized by a Sahelian-soudanian climate in its south part and a Sahelian climate in its north part (Fontes and Guinko, 1995). The mean annual rainfall amount goes from 300 to 600 mm, with pronounced rainy and dry seasons. The main characteristic of the rainfall is irregularity in time and space. Soils have a strong tendency to seal and crust and have a low organic matter content (< 15 g kg\(^{-1}\)), low nitrogen content (< 0.7 g kg\(^{-1}\)), and low available phosphorous (< 0.06 g kg\(^{-1}\)). Mixed crop-livestock farming system is the current major practice, and agricultural production is presently dominated by cereal-based systems, which are 97% rain-fed (FAO, 1995). In this zone, the combined effects of climatic conditions, poor soil quality and human activities has resulted in soil degradation, due to crusting, sealing, erosion by water and wind (Zougmoré et al., 2000) and the loss of nutrients through erosion and runoff (Roose, 1981). Because of the degradation phenomenon, crop production and animal production are at risk (Mando and Stroosnijder, 1999). To solve the degradation problem, farmers have developed a range of measures, including runoff control, soil structure improvement, and nutrient management (Mando et al., 2001). Indigenous as well as introduced soil and water management practices like stone rows, mulching, zaï pits, and half-moons, are increasingly being used by NGOs, development projects and public bodies to rehabilitate soils in the Sahel (Reij et al., 1996). Animal production has a great importance in this area, for being a source of cash, animal manure, and for playing a strategic role in risk reduction for rainfed agriculture (Zoundi et al., 1994; Zoundi, 1997; Zoundi et al., 2004).

This case study reports briefly the effect of some of these practices on soil productivity, crop performance, income generation, and food security achievement. Several research studies have been conducted by the institute for environment and agricultural research (IN.E.R.A) with the collaboration of IFAD (International Fund for Agricultural Development) project (CES/AGF) in Burkina Faso, and of the Canadian International Development Research Center (IDRC) regional project “Crop-livestock integration and sustainable natural resources management”. Farmers involved in this integrated agricultural research for development (IAR4D) were organized through village based organizations (“Groupements villageois – GV”).

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11 IFAD Supported Case Study
12 Natural Resources Management & Production System Department, INERA, Ouagadougou, Burkina Faso
Description of the Practices

Soil and Water Management Practices

Stones rows - This technique consists of two rows of laterite rocks placed in a furrow dug with a subsoiler or pick. The upslope row is of large blocks (35 cm x 25 cm) of stones partly buried (5 cm depth) in the soil while the downslope row consists of small stones (15 cm x 15 cm) placed so as to stabilize the first row. The earth excavated from the furrow is replaced along the stones to fill up remaining holes in the soil. The heap of stones weighs about 80-90 kg m\(^{-1}\) and is about 20-30 cm high from the soil surface.

To built stones rows populations organized themselves through village based organizations (GV) for stones transportation and for rows building. External support is sometime needed for stones collection from other places to the villages. This required logistic support from project (IFAD project) or NGOs.

Photo 1: Stone row in farmers’ training field at Samba village, Burkina Faso (Photo by R. Zougmore)

Zaï and Half-Moon Techniques - The zaï technique is a complex system for restoring the productivity of degraded soils by concentrating runoff water and organic matter in basins dug during the dry season (Roose et al., 1999). It consists in digging small pits 20-40 cm in diameter and 10-15 cm deep in order to collect runoff water. Average sorghum crop density is 31750 zaï holes (0.80 x 0.40 m) per hectare. A handful (0.3 kg) of animal manure or compost is supplied per pit, i.e. 9.5 t ha\(^{-1}\). Compost is produced in a compost pit.

The half-moon is a runoff water collection device, mainly adapted to the Sahelian and Sudano-sahelian zones where it is made on gentle slopes (< 3%). The basin in each half-moon was dug with a hoe or a pick so as to break the crusted layer on the soil surface, and to collect the runoff water. In each half-moon the cultivated area was 6.3 m\(^2\). According to usual practice, animal manure or compost were supplied at a dose of 35 kg (a barrowful) per half-moon, i.e. 14.6 t ha\(^{-1}\). Soils are totally bared and very degraded (soil depth: 30 cm, pH (H\(_2\)O) < 5, SOM (1.2 %), N (0.6 g kg\(^{-1}\)), total P (0.66 g kg\(^{-1}\)), CEC (0.11 mol kg\(^{-1}\)). Zaï and half-moon techniques were made individually by farmers; this required human labor.
Mulching

Studies (Mando, 1997) in this region showed that mulch, made of natural pasture of cereals straw, or tree leaves, when placed on a crusted and bare soil, can trigger termite activity within a few months. Termite activity results in a change in soil structure. The combination of the increase of porosity and infiltration and the cover effect of mulch results in an increase of soil water availability in the soil profile during the growing season. Termite activity enhances decomposition of the mulch and hence nutrient release in the soil. The change of soil characteristics due to termite activity was enough to create conditions necessary for natural vegetation development and crop production on previously degraded bare soils. Farmers in this zone sometimes burn the mulch before sowing.

Some farmers combine on the same plot many technologies to somehow rehabilitate quickly the degraded zipellé (bare soils). This was the case of a farmer of Bogoya village who used stone rows, zaï pits, mulching, and tree planting techniques to rehabilitate and intensify crop production on an abandoned zipellé.

Sheep Fattening Techniques

This consists of seasonal sheep fattening practices through the optimization of locally available feeds resources. Feed rations consist of 70-80% of locally produced or collected feeds such as crop residues (sorghum straw, cowpea or groundnut haulms), cereals bran, natural pasture hay, cowpea husks, tree fodders (Pterocarpus lucens leaves, Faidherbia albida, Acacia siberiana and Piliostigma reticulatum pods) and, 20-30% of off-farm feeds such as cottonseed cake. Feeding practice was managed by farmers and each fattening-lot was composed of 1 to 10 sheep with average age of 1-1.5 years. These fattening techniques give opportunities for nutrients recycling at farm level. Production of animal manure during the operation is particularly important for soil and water management techniques (zaï, half-moons...). Sheep fattening is done during the dry season for 3 to 4 months duration. Fattening operation for 5 sheep required 140 US $ investment for sheep (120 US $) and for off-farm feeds (20 US $) purchase. This investment may be reduced to a minimum if farmer can draw animal his own herd.
Assessment and Impact

Impacts of Combined Technologies

Investigations (Zougmore et al., 2000) ‘table 1) clearly showed that under water limiting conditions, the stone rows technique was efficient in improving soil water content through runoff control. Under water limiting conditions, crops in plots with stones could yield two to three times more than crops in control plots, but under heavy rain conditions, stone rows could be harmful to crop production as they can create waterlogging conditions. Moreover, supplying compost or animal manure in combination with stone-rows resulted in sorghum grain yield increase of about 180%.

It was found that applying compost or animal manure, with or without local phosphorus fertilizer, allowed yields of from 600 to 1600 kg ha\(^{-1}\) of sorghum grain, i.e. 24-39 times the yield obtained in the half-moon treatment without any amendment (Zougmore et al., 2003). Adding local rock phosphate in the zaï holes induced sorghum grain yield to increase by 63%. Merely breaking up the surface crust to improve water infiltration did not increase sorghum yield. Studies showed that on a degraded zippelé, the mere fact of restoring favorable soil moisture conditions is not enough to improve crop production. The removal of the water constraint by destroying the surface hard pan reveals the second major constraint, which is the chemical poverty of the soils in this area. Well decomposed organic matter such as animal manure and compost applied in the zaï or half-moon holes, are the best substrates that can provide sorghum plants with the nutrients required for growth. Moreover, adding local rock phosphate to compost or mulch appeared to be an interesting alternative for improving soil productivity.
Table 1: Effect of half-moon and zaï practices on sorghum performance in 1998 and 1999 at Pougyango village, Northern Burkina Faso (kg ha⁻¹)

<table>
<thead>
<tr>
<th></th>
<th>Grain yield</th>
<th></th>
<th>Straw yield</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Half-moon + animal manure</td>
<td>1614 a</td>
<td>1104 a</td>
<td>4291 a</td>
<td>2542 a</td>
</tr>
<tr>
<td>Half-moon + compost + rock phosphate</td>
<td>927 b</td>
<td>1104 a</td>
<td>2729 ab</td>
<td>2479 a</td>
</tr>
<tr>
<td>Half-moon + compost</td>
<td>1000 b</td>
<td>875 ab</td>
<td>3125 abc</td>
<td>2458 a</td>
</tr>
<tr>
<td>Zaï + animal manure + mulch + rock phosphate</td>
<td>708 bc</td>
<td>694 bc</td>
<td>3906 ab</td>
<td>1619 abc</td>
</tr>
<tr>
<td>Zaï + animal manure + mulch</td>
<td>438 cde</td>
<td>181 de</td>
<td>2395 abc</td>
<td>744 bcd</td>
</tr>
<tr>
<td>Zaï + animal manure</td>
<td>375 cde</td>
<td>206 de</td>
<td>2125 bcd</td>
<td>725 bcd</td>
</tr>
<tr>
<td>Half-moon</td>
<td>41 de</td>
<td>42 e</td>
<td>114 bcd</td>
<td>177 d</td>
</tr>
<tr>
<td>T0 (control)</td>
<td>0 e</td>
<td>0 e</td>
<td>0 e</td>
<td>0 d</td>
</tr>
</tbody>
</table>

Signif. 5%: HS: highly significant.

Treatments with the same letter are not statistically different at p= 0.05.

Investigations in the Central Plateau (Zoundi et al., 2004) (table 2) indicated that sheep fattening system has impact on mixed crop-livestock farms in this part of Burkina Faso, as it induces income increase, and improves food security. Fattening diets based on farmers’ knowledge and including local feeds (≥70% in the diet), such as crop residues, forage trees, and others resources available in the farm, are of great importance in these mixed crop-livestock farming systems. Economical impact of these fattening diets through Linear Programming Model indicated that farm engaged in such a fattening with 5 rams during a good rainy season and 11 rams the dry or bad rainy season can generate sufficient income level to ensure self-sufficiency by affording the respective cereals extra-needs of 585 kg.year⁻¹ and 1,426 kg.year⁻¹ while generating profit. Moreover, fattening 11 rams allows production of compost manure for an additional 4.31 ha compared to the traditional practice.

Theses practices increase the role of livestock in the mixed farming systems, and allow farmers to produce more organic fertilizer for soil and water conservation techniques such as zaï, half-moons…
Table 2. Improved livestock management in mixed crop-livestock farming system and food security achievement in the Yatenga zone, Burkina Faso

<table>
<thead>
<tr>
<th>Quality of rainy season</th>
<th>Areas fertilized with animal manure (ha)</th>
<th>Number of goats sailed to purchase food</th>
<th>Additional profit (F CFA) made after food purchase</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Control (without any livestock intensification practice)</td>
<td>2.92</td>
<td>2</td>
<td>8</td>
</tr>
<tr>
<td>2. Alternative 1: Fattening 2 rams/farm</td>
<td>3.70</td>
<td>1</td>
<td>6</td>
</tr>
<tr>
<td>+ Diet 1</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>+ Diet 2</td>
<td>1</td>
<td>6</td>
<td>3,243</td>
</tr>
<tr>
<td>3. Alternative 2: Fattening 5 rams/farm</td>
<td>4.88</td>
<td>0</td>
<td>4</td>
</tr>
<tr>
<td>+ Diet 1</td>
<td></td>
<td></td>
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</tr>
<tr>
<td>+ Diet 2</td>
<td>0</td>
<td>4</td>
<td>3,961</td>
</tr>
<tr>
<td>4. Alternative 3: Fattening 11 rams/farm</td>
<td>7.23</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>+ Diet 1</td>
<td></td>
<td></td>
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</tr>
<tr>
<td>+ Diet 2</td>
<td>0</td>
<td>0</td>
<td>57,196</td>
</tr>
<tr>
<td>5. Alternative 4: Fattening 30 rams/farm</td>
<td>14.68</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>+ Diet 1</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>+ Diet 2</td>
<td>0</td>
<td>0</td>
<td>225,776</td>
</tr>
</tbody>
</table>

Source: Zoundi et al. (2004)

**Diet 1**: Local feeds resources: 83% (15% sorghum straw, 32% cowpea husk, 36% Piliostigma reticulatum pods), 17% cottonseed cake

**Diet 2**: Local feeds resources: 83% (15% sorghum straw, 30% cowpea husk, 38% cowpea haulms), 17% cottonseed cake

These impacts give indications for decision making tools to promote Agricultural Good Practices (AGP) based on integrated crop-livestock farming systems for smallholders farmers living in these risky environments of the Central Plateau.
Factors Contributing to Successes and Failures

The access of smallholders farmers to innovations for sustainable agriculture in this case study is mainly due to the combination of many factors.

Role of Project Interventions: Support for Investment

Projects interventions in soil and water management activities are very helpful for farmers, which don’t have sufficient means to realize their land management themselves. The IFAD project on soil and water conservation and agroforestry (CES/AGF) helps farmers with equipments for contour lining, furrow digging, laterite rock transport, and compost pits realization. Framers input consists essentially in labor input during the whole process of elaborating activities to their realization on fields. The principle of participatory approach is appeared to be very successful as many farmers which benefit from the project activities claim that thanks to this collaboration, their land productivity have increased significantly. Indeed, 7 years after the project has started, farmers became more aware about the degradation problem and are able to choose the appropriate technologies that have been evaluated on their own fields by INERA researchers.

Demand-Driven Approach Developed

Innovation process developed through IFAD and IDRC projects is mainly oriented by demand-driven approach. This participatory technology development (PTD) included diagnostics, co-definition of research protocols with farmers, implementation and evaluation. All research activities are based on farmers’ demands, fitted on their local conditions, and were managed by producers. This approach give and opportunity for farmers to add their knowledge and skill in innovation process. So, many indigenous innovations (zaï pits, mulching…) developed by farmers have been concerned in the process. This is one of the major factors of great success.

Farmers’ Connection to Markets

Innovation process like animal fattening practice, legume production (cowpea)…, gives opportunity for farmers to be more connected to local and national markets and to generate additional income for food security achievement. This environment has been an incentive source of motivation for farmers to invest for these Agricultural Good Practices utilization.

Opportunities for mainstreaming and scaling-up

Many factors have to be considered for the mainstreaming and the scaling-up of the AGP in uncertain environments:

Investments required: Soil and water management techniques required public investment to cover some costs: rocky stone transport and equipment (80,000 – 90,000 F CFA per ha), farmers capacities strengthening
**Strong farmers’ organizations:** This is required to tackle some key issues: human labor mobilization, organization for off-farm inputs supply, such as rock phosphate, chemical fertilizers, feed concentrate (cottonseed cake) and, for markets access.

**Market opportunities:** These are the best incentive for investment in innovation and the use of AGP. For legume such as cowpea, local, national and regional markets exist. For cereals such as sorghum and millet the main challenge is to create opportunities to give add-value to these products. Processing could play an important role.

**References**


Titre: Zaï mécanisé à l’aide de la dent IR 12

Pays: Burkina Faso, Région du Sahel

Auteurs: Sohoro Adama et Samandoulgou Yahaya; Sanou Seydou, Kiéma André

Catégorie de la pratique: pratique locale améliorée de conservation des eaux et des sols (CES) et de récupération des terres dégradées.

Contexte

Le Sahel burkinabé est compris entre le 13ème et le 15ème degré de Latitude Nord. Sa superficie est estimée à de 36 896 km², soit un peu plus de 13% de la superficie du territoire nationale. Administrativement, il couvre quatre provinces qui sont : OUDALAN, SENO, SOUM et YAGHA.

Il présente un milieu physique très hétérogène au niveau des sols, un réseau hydrographique faible, une aridité croissante et une pluviométrie qui accuse un recul très important au fil des années. En général de type sahélien, le climat est caractérisé par une pluviométrie annuelle variant entre 400-750 mm d’eau repartie entre les mois de juin et septembre. D’une manière générale, c’est une zone de steppe sahélienne à épineux où dominent les graminées annuelles en recouvrement discontinue et par une strate herbacée où dominent les graminées annuelles en recouvrement discontinue et par une strate arbustive très ouverte (Zerbo, 1993). Les différents types de végétations présentent une corrélation avec les formes du relief et les unités pédologiques

La population du Sahel était de 710 540 habitants pendant le recensement national de 1996, soit une densité de 19,3 habitants au km² (INSD,1996). Elle est composée d’une dizaine d’ethnies dont les plus représentées sont:
- les Peulh (35%);
- les Rimaibé et les Bella (20%);
- les Mossi (19%);
- les Fulsé (15%);
- les autres: Sonraï, Touareg, Gourmantché,…(11%).

Les principales activités socio-économiques sont dominées, à l’instar des autres régions du Sahel, par l’agropastoralisme. L’agriculture est essentiellement basée sur le mil qui concerne 90% des surfaces cultivées et le sorgho 10 %. Elle occupe plus de 82% des sahéliens et les principales cultures sont le mil (Pennisetum typhoides L.) et le sorgho (Sorghum bicolor L. Moench). En année de pluviométrie moyenne, les rendements de mil sont de 350 kg par ha tandis que ceux du sorgho sont de 400 à 500 kg (période 1990-2000). Les principales espèces animales élevées sont les bovins, les caprins, les ovin et les asins. Le cheptel vif est évalué en 1998 à 576 000 têtes de bovins, 1 713 000 têtes de caprins, 739 700 têtes d’ovins, 1 713 300 volailles, 52 800 têtes d’asins, et 14 132 têtes de camelins (Kiéma, 2002). Ce cheptel tire l’essentiel de ses

13 Agronome, système de production; agro-sociologue; agro-pédologue; pastoraliste; INERA, CRREA du Sahel, Burkina Faso
ressources alimentaires des parcours naturels. Les techniques de production demeurent encore traditionnelles c’est à dire extensives (ICRA / INERA, 1994; Poissonet et al, 1997).

Les autres activités telles que l’artisanat, le commerce, la cueillette, la pêche, l’orpaille bien que présentes dans les pratiques quotidiennes des populations sahéliennes , restent des activités secondaires.

Cependant en dépit des conditions physiques très défavorables, le Sahel peut demeurer une zone agropastorale (mais pastorale par excellence) à condition d’adopter des systèmes de production et de gestions des ressources naturelles appropriées aux conditions actuelles

Les Contraintes de la Region
Le recensement des contraintes et des potentialités de la région a été réalisé en 1994 par l’INERA lors d’un atelier pendant la rédaction du premier plan stratégique de la recherche agricole du Burkina Faso(INERA,1994).Au total une dizaine de contraintes ont été inventoriées:
  - insuffisance de la pluviométrie
  - dégradation du couvert végétal (surtout la mortalité des ligneux)
  - diminution des ressources en eau
  - difficultés d'approvisionnement en intrants et matériels agricoles
  - sols fragiles et soumis à l'érosion hydrique et éolienne
  - conflits entre communautés pour l'utilisation de l'espace
  - forte pression humaine et animale autour des points d'eau
  - dégradation des parcours naturels
  - mauvaise exploitation des ligneux fourragers
  - difficultés d'abreuvement des animaux en saison sèche

Les Potentialites de la Region
La région du Sahel dispose de six (6) importantes potentialités :
  - faible pression humaine sur les terres de culture
  - zone d’élevage par excellence,
  - existence de mares naturelles plus ou moins pérennes
  - abondance de la végétation herbacée
  - existence de nombreux projets de développement et ONG,
  - existence d’une équipe régionale de recherche


Au niveau de la terre, l’aggravation des phénomènes d’érosion (hydrique et éolienne) se traduit par l’accélération des ravinements et la dénudation des glacis. Aussi, des actions de restauration de cette dégradation par des méthodes et techniques de CES ont été initiées par divers acteurs du développement rural.

Pour freiner la dégradation des sols, un certains nombre de technologies ont été testées aussi bien dans la région sahélienne que partout ailleurs à l’intérieur du pays(Ganaba et al.,2002).
Parmi elles on cite le zaï dont la performance dépasse les frontières nationales en matière de récupération des sols dégradés.


Description de la pratique

Le zaï est une technique de récupération des sols agricoles colmatés et encroûtés (zipellé). Il est originaire de la région du Yatenga, au nord du Burkina Faso.

Le zaï désigne un poquet, un trou creusé dans le sol; ce sont des trous dont les dimensions varient de 15 à 25 cm de profondeur et de 25 à 30 cm de diamètre. Ils sont creusés en ligne perpendiculaire à la pente du terrain et couvrent toute la superficie de la parcelle. La terre issue des poquets est déposée en aval de celui-ci afin de permettre au zaï de jouer pleinement son rôle. On y apporter de la matière organique (fumier ou compost).

Le zaï, là où il est pratiqué, permet de capter les eaux de pluie et de ruissellement, de garder l’humidité nécessaire pour les végétaux. En outre, il permet l’accumulation de la terre arrachée en amont et, comme les cordons pierreux, l’accumulation de la matière organique et la réutilisation des terres stériles.

Le zaï s’est montré très efficace en matière de CES avec une augmentation de rendement dépassant de 2 à 4 fois les parcelles témoins ; mais sa réalisation demande de gros efforts et surtout une importante main d’œuvre. Les recherches au sein de l’INERA et de l’IRSAT ont permis de mettre au point l’outil « dent IR 12 » qui permet en scarifiage croisé en traction animale d’obtenir du zaï. Cette nouvelle technologie a été testée en 2004 dans le Sahel et a obtenu un grand intérêt par les producteurs. La présente action vise à étendre l’expérience en un grand nombre de producteurs afin d’évaluer les conditions d’adoption du zaï mécanisé au Sahel.

Les bénéficiaires sont le groupement villageois « NABOSNOGO » de Liky et le groupement villageois « NERWAYA » de Bangataka

Le travail se fera dans 2 villages qui sont Bangataka(Dpt de Gorgadji) et Liky(Dpt de Arbinda).La mise en place et l’ensemble des travaux se feront avec les groupements villageois concernés à travers leurs membres qui possèdent un attelage de traction animale.

Tous les travaux seront conduits par les producteurs innovateurs en collaboration avec l’équipe de recherche et développement.

Les technologies à mettre en place sont:
- l’utilisation de la dent IR 12 conçue pour la traction animale,
- l’introduction de la culture pure du niébé et du sésame
Chaque producteur disposera d’au moins ¼ à 1 ha. Il y fera d’abord le zaï mécanique et mettra en culture du sésame et du Niébé en culture pure. Il pourra aussi planter des arbres utilitaires comme Fedherbia albida, Jujuphus mauritiana, et Acacia senegal. Il peut aussi envisager le semis des herbacées fourragères.

4 unités supplémentaires de dent IR 12 seront achetées et mises à la disposition du groupement villageois de chaque village et les producteurs pourront en disposer gratuitement pour leur activité.

Les chercheurs assureront :
- la formation des producteurs sur les techniques d’entretien des animaux, d’utilisation du matériel de culture attelée et la pratique du zaï mécanique ainsi que la production du compost
- L’évaluation socio-économique des activités
- La coordination des visites commentées et des rencontres d’échange avec d’autres OP.

Ils serontassistés par deux enquêteurs ou observateurs qui sont à recruter.

Les autres partenaires contribueront à la sensibilisation et à la mobilisation des populations cibles à s’approprier la technologie.

Les fonds nécessaires sont estimés à 5 500 000 fr CFA dont 500 000 fr seront l’apport des populations bénéficiaires (cf tableau suivant).

**Tableau n° 1. Des besoins en Ressource financière (X 1000 cfa)**

<table>
<thead>
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<th>Rubriques</th>
<th>IFSA</th>
<th>Apport OP</th>
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<td>Total</td>
</tr>
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<td>carburant et lubrifiant</td>
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**Condition de réalisation et impact**

Le zaï pouvant restaurer la fertilité des sols et multiplier les rendements actuels (200 kg/ha) de 2 à plus de 4 fois constitue une technologie idéale dont l’adoption permettrait de tendre vers la sécurité alimentaire des exploitations familiales du Sahel.

Les résultats attendus à la fin des travaux sont:
- les producteurs sont informés et formés sur les capacités réelles du zaï mécanisé
- Le zaï mécanique est adopté par une grande majorité des producteurs des villages tests
- les produits agricoles et les revenus des producteurs ont augmenté
- La fertilité des sols dégradés est restaurée, entretenue et conservée

**Facteurs de réussite ou d’échec**

Il y a plus de facteurs favorables à la réussite du projet car les producteurs possèdent déjà les animaux de trait et connaissent l’impact du zaï sur l’augmentation des rendements agricoles. Il leur faut un peu de moyen pour acquérir la dent IR 12 et une bonne formation à son utilisation optimale et à rentabiliser les investissements d’une manière durable.

Indicateurs objectivement vérifiables :
- augmentation de la capacité des producteurs à utiliser la culture attelée.
- données agronomiques et évaluation socio-économique
- recolonisation des terres dégradées et abandonnées
- opinion positive des producteurs

**Opportunités de vulgarisation**

En vue de la vulgarisation il est prévu l’organisation des échanges entre OP sur l’impact du zaï mécanisé la production de documents qui seront entre autres:
- rapport de formation
- rapport d’enquête opinion
- rapport d’activités
- communication
- publication

C’est même une occasion pour rentabiliser la culture attelée car les producteurs équipés pourraient faire des travaux à façon chez les non équipés contre des renumérations.

**Référence bibliographique**


Title of Best Practice: The Zaï mechanized using the tooth IR 12

Country: Burkina Faso

Authors: Sohoro Adama and Mrs: Smandoulgou Yahaya; Sanou Seydou; Kiéma André

Category of Practice: Local improved practice of conservation of water and soils (CES) and reclamation of the degraded soils.

Context and genesis

The Sahelian region of Burkina Faso lies between the 13th and the 15th Northern degree of Latitude. Its surface is estimated at 36 896 km², that is to say a little more than 13% of the national surface of the territory. Administratively, it covers four provinces which are: OUDALAN, SENO, SOUM and YAGHA. It presents a very heterogeneous physical environment at the level of the grounds, a weak hydrographic network, an increasing aridity and a rainfall which shows a very important retreat with the passing of years. In general of sahelian type, the climate is characterized by an annual rainfall varying between 400-750 mm of water during between September and June. Generally, it is a zone of sahelian steppe to thorn-bush it is also characterized by a herbaceous layer where dominate annual graminaceous in the covering discontinuous one and by a very open shrubby layer (Zerbo, 1993). The various types of vegetations present a correlation with the forms of the relief and the pedological units. The population of the Sahel was of 710 540 inhabitants during the national census of 1996, that is to say a density of 19,3 inhabitants to the km² (INSD, 1996). She is made up of ten ethnos groups of which the most represented are: - Peulh (35%); - Rimaibé and Bella (20%); - Mossi (19%); - Fulsé (15%); - others: Sonrai, Tuareg, Gourmantché... (11%).

The principal socio-economic activities are dominated, following the example other areas of the Sahel, by the agropastoralism. Agriculture is primarily based on the millet which relates to 90 % of cultivated surfaces and the sorghum 10 %. It occupies more than 82% of the sahéliens and the principal cultures are the millet (Pennisetum typoides L.) and the sorghum (Sorghum bicolor L Moench). In year of average rainfall, the outputs of millet are 350 kg per ha while those of the sorghum are 400 to 500 kg (period 1990-2000). The principal high animal species are the bovines, the caprine ones, the sheep and the asins. The livestock is evaluated in 1998 to 576 000 heads of bovines, 1 713 000 heads the caprine ones, 739 700 heads of sheep, 1 713 300 poultres, 52 800 heads of asins, and 14 132 camelene heads (Kiéma, 2002). This livestock draws the essence of its food resources from the natural courses. The techniques of production remain still traditional i.e. extensive (ICRA/INERA, 1994; POISSONET et al., 1997). The other activities such as the craft industry, the trade, the gathering, fishing, gold washing although present in the daily practices of the sahelian populations, remain ancillary activities. However in spite of the very unfavourable physical conditions, the Sahel can remain a agriculture and animal production zone (but most pastoral) with the prevision of adopting systems of production and natural stock managements adapted with the current conditions.

14 Agronomist; Agro-Social Scientist; Soil Scientist; Animal Scientist. INERA, CRREA of the Sahel, Burkina Faso
Constraints of the area: The census of the constraints and the potentialities of the area was carried out in 1994 by the INERA at the time of a workshop during the drafting of strategic foreground of agricultural research of Burkina Faso (INERA, 1994). A total ten constraints were inventoried: - insufficiency of rainfall - degradation of vegetable cover (especially the mortality of the ligneous family) - reduction in the water resources - difficulties of provisioning of inputs and farm equipments - grounds fragile and subjected to hydrous and wind erosion - conflicts between communities for the use of space - strong human and animal pressure around the water points - degradation of the natural courses - bad exploitation of the fodder ligneous family - difficulties of watering of the animals in season drys.

Potentialities of the area: The area of the Sahel has six (6) important potentialities: - low human pressure on the grounds of culture - cattle-breeding area par excellence, - existence of more or less perennial natural ponds - abundance of the herbaceous vegetation - existence of many projects of development and ONG, - existence of a regional team of research. Since the great drynesses of the years 1970 and 1980, the sahelian area of Burkina Faso undergoes a continuous degradation of its natural resources. It is characterized by a strong degradation of the grounds and vegetable cover. On the level of the ground, the aggravation of the phenomena of erosion (hydrous and wind) results in the acceleration of gullies and the denudation of the glacis. Also, of the actions of restoration of this degradation by methods and techniques of these were initiated by various actors of the rural development. To slow down the impoverishment of the soil, certain numbers technologies were tested as well in the sahelian area as everywhere else inside the country (Ganaba and Al, 2002). Among them one quotes the zaï whose performance exceeds the national borders as regards recovery of the degraded grounds.

INERA will be the structure leader in this project. The other structures or organizations partners are: organizations of the farmers (O P), Regional Directions charged with Agriculture (DRAHRH), animal production (DRRA) and Environment (DRECV) of the Sahel.

Description of the practice

The zaï is a technique of recovery of the clogged and encrusted agricultural grounds (zipellé). It is originating in the area of Yatenga, in the north of Burkina Faso. The zaï indicates a seed hole, a hole dug in the ground; these are holes whose dimensions vary from 15 to 25 cm of depth and 25 to 30 cm in diameter. They are dug in line perpendicular to the slope of the ground and cover all the surface of the piece. The ground resulting from the seed holes is deposited downstream from this one in order to make it possible the zaï to fully play its part. One to bring organic matter there (manure or compost). The zaï, where it is practised, makes it possible to collect streaming and rainwater, to keep moisture necessary for the plants. Moreover, it allows the accumulation of the ground torn off upstream and, like the stony cords, the accumulation of the organic matter and the re-use of the unproductive lands. The zaï was shown very effective as regards these with an increase in output exceeding from 2 to 4 times the pilot pieces; but its realization asks for large efforts and especially an important hand labor. Research within the INERA and of the IRSAT made it possible to develop the tool "tooth IR 12" which allows in scarifying crossed in animal haulage to obtain zaï. This new technology was tested in 2004 in the Sahel and obtained a great interest by the producers. The present action aims at extending the experiment in a great number of producers in order to evaluate the conditions of adoption of the
zaï mechanized in the Sahel. The recipients are village grouping "NABOSNOGO" of Liky and village grouping "NERWAYA" of Bangataka. Work will be done in 2 villages which are Bangataka (Dpt de Gorgadji) and Liky (Dpt de Arbinda). Installation and the whole of work will be done with the village groupings concerned through their members who have an attachment of animal haulage. All work will be carried out by the innovating producers under development collaboration with the team of research and development actors. Technologies to be set up are: - the use of the tooth IR 12 conceived for the animal haulage, - the introduction of the pure culture of niébé and sesame Each producer will have at least ¼ with 1ha. It there will make initially the mechanical zaï and will put in culture sesame and of Niébé in pure culture. It will be able to also plant utility trees like Fedherbia albida, Jujuphus mauritiana, and Acacia senegal. It can also consider the sowing of herbaceous fodder. 4 additional units of tooth IR 12 will be bought and availability of the village grouping of each village and the producers will be able to lay out about it free for their activity. The researchers will ensure: - training of the producers on use, the interview techniques of the animals of the material of harnessed culture and the practice of the mechanical zaï as well as the production of the compost - the socio-economic evaluation of the activities - the coordination of the visits with accompanying notes and the meetings of exchange with other successful cases. They will be assisted by two investigators or observers which are to be recruited. The other partners will contribute to the sensitizing and the mobilization of the target populations to adapt technology. The funds necessary are estimated at 5 500 000 Fr CFA of which 500 000 Fr CFA will be the contribution of the farmers (ie- following):

**Total Contribution: 5 000 000 Fr CFA**
- Formation: 300 000 F
- Labor: 600 000 F
- Fuel: 700 000 F
- Perdiem: 900 000 F
- Car location: 300 000 F
- Input for production: 300 000 F
- Tools and materials: 550 000 F
- Office materials: 150 000 F
- Edition: 100 000 F
- Computer in put: 550 000 F
- Moto cycle maintenance: 200 000 F
- Communication: 100 000 F
- Administration cost: 250 000 F

**Farmers contribution: 500 000 Fr CFA**
- Formation: 400 000 F
- Tools and materials: 100 000 F
Condition of realization and impact

the zaï which can restore the fertility of the grounds and multiply the now outputs (200 kg/ha) of 2 with more than 4 times constitutes an ideal technology whose adoption would make it possible to tend towards the food safety of the family exploitations of the Sahel. The results awaited at the end of work are: - the producers informed and are trained on the real capacities of the mechanized zaï - the mechanical zaï is adopted by a large majority of the producers of the villages tests - the agricultural produce and the incomes of the producers increased - the fertility of the degraded grounds is restored, maintained and preserved

Factors of success or failure

There are more factors to the success of the project because the producers have already the draft animals and know the impact of the zaï on the increase in the agricultural outputs. They need a little means to acquire the tooth IR 12 and one good formation with its optimal use and to make profitable the investments in a durable way. Objectively verifiable indicators: - increase in the capacity of the producers to use the harnessed culture. - agronomic data and socio-economic evaluation - recolonisation of the degraded and given up grounds - positive opinion of the producers

Opportunities for mainstreaming and scaling-up

For scaling-up it is envisaged the organization of the exchanges between farmer organizations on the impact of the zaï mechanized and the production of documents which will be integrate annual report, investigation opinion, management report, communication and scientist publication. It is even an occasion to make profitable the harnessed culture because the producers equipped could make up works at not equipped against renumérations.

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Burkina Faso. Communication présentée à l’atelier organisé par JICA tenu à Dori le 30
Titre de la pratique: Gestion Intégrée de l’eau et des éléments nutritifs dans les systèmes de culture à base de sorgho – mil / niébé au Burkina Faso.

Pays et région où il a été développé: Burkina Faso, zone centre et nord

Auteurs du cas d’étude: Korodjouma Ouattara, Moussa Bonzi, Souleymane Ouedraogo, Francois Lompo

Catégorie de la pratique: Conservation des eaux et de la fertilité des sols en agriculture

Contexte et genèse de la pratique

Les systèmes de production
Les provinces du Bazega et du Yatenga sont situées respectivement dans les régions Centre-Sud et Nord-Ouest du Burkina Faso. La population dans ces zones est de 80 à 90 % rurale avec une densité moyenne de 41 habitants au kilomètre carré. La densité de la population rapportée aux surfaces agricoles utiles est très élevée et atteint 202 habitants au km² dans le Yatenga. Les régions sont situées dans la zone climatique soudano-sahélienne avec une pluviométrie moyenne annuelle se situant entre 400 et 800 mm (Somé, 1989). La saison des cultures pluviales se situe entre juin et septembre et dure dans le meilleur des cas environ 120 jours et moins de 90 jours dans les années «sèches».

Le système de culture est à base de céréales, principalement mil et sorgho. Le maïs n’occupe que 5 à 10% des superficies cultivées et le riz ne dépasse pas 1%. Les cultures irriguées sont le riz, le maïs et les cultures maraîchères sont de plus en plus importantes. Les productions agricoles fluctuent fortement d’une année à l’autre selon les conditions pluviométriques.

La production en céréales des exploitations agricoles de ces zones ne couvre pas les besoins alimentaires annuels des populations d’où un déficit plus ou moins prononcé suivant les saisons agricoles. Ce déficit est principalement du à la baisse de la fertilité et à l’érosion des sols. Ces régions sont caractérisées par une forte dégradation du milieu, suite à l’effet combinée des déficits pluviométriques, de la pression foncière et du surpâturage.

Justification de l’action
Dans les région centre et nord du Burkina, la jachère n’existe plus si bien que le système traditionnel de culture ne permet plus de maintenir les rendements des cultures du fait de la baisse de la fertilité des sols (Piéri, C., 1989 ; Sédogo, 1993 ; César et Coulibaly, 1993). Pour continuer de produire, des principes et des pratiques assurant la reconstitution de la matière organique du sol ont été intégrés dans les systèmes de culture. Sur les sols à kaolinite d’Afrique sub-Saharienne, de nombreuses publications ont montré que sans apport de matière organique, la fertilisation minérale seule ne permet pas de maintenir les rendements des cultures et la fertilité des sols sur le long terme à cause de l’acidification, les pertes en matière organique et la
compaction des sols (Sédogo, 1991 ; Feller, 1995 ; Ouédraogo et al. 2001 ; Zougmoré et al., 2002).

Le premier objectif de la gestion intégrée de la fertilité des sols est de combiner les méthodes de conservation des eaux et des sols à la gestion de la fertilité des sols dans un système de culture écologiquement sain, économiquement viable et efficient.

Les productions agricoles dans le système actuel à base de sorgho et mil ne couvrent pas le plus souvent les besoins alimentaires des populations des zones du projet. Pour améliorer la productivité de ce système et accroître la production et les revenus des populations de ces régions il est impérieux d’envisager un système plus intégré qui combine l’utilisation des variétés améliorée (de mil, sorgho et niébé), des techniques de conservation des eaux et des sols et des fertilisants organiques et inorganiques. Ce système intégré en plus de l’augmentation de la productivité s’inscrit également dans la durabilité. Son effectivité dépend de l’amélioration du savoir-faire, à travers la formation, du personnel d’encadrement et de celui des producteurs eux-mêmes.

Organisation des producteurs
Les producteurs sont organisés en groupements villageois masculin, féminin ou mixte de paysans agriculteurs.

Description de la pratique
Les innovations à introduire se basent sur les combinaisons de la fertilisation organo-minérale, la CES (zaï), la rotation et/ou la culture associée céréale/légumineuse et l’utilisation de variétés améliorées.

Fertilisation minérale; NPK, Phosphate naturel
Fertilisation organique; fumier, compost.

Le dispositif expérimental des tests sera en milieu paysan. Il comprendra des traitements agronomiques combinant:
- une technique d’économie de l’eau à la parcelle (Zaï)
- la fertilisation organo-minérale (NPK + fumier ou compost)
- un Système de rotation sorgho/niébé ou mil/niébé avec les variétés les plus prometteuses
- un système de culture associée sur différentes lignes de semis, Sorgho/niébé ou mil/niébé avec les variétés les plus prometteuses.

Activités de tests
Deux types de tests sont prévus:

a) Tests sur les systèmes de culture à base de mil;
   Traitement 1: mil en rotation avec le niébé sur zaï + fertilisation organo-minérale
   Traitement 2: mil en association avec le niébé sur zaï + fertilisation organo-minérale
   Traitement 3: pratique du paysan à base de mil

b) Tests sur les systèmes de culture à base de sorgho;
Traitement 1: sorgho en rotation avec le niébé sur zaï + fertilisation organo-minérale
Traitement 2: sorgho en association avec le niébé sur zaï + fertilisation organo-minérale
Traitement 3: pratique du paysan à base de sorgho

Activités de formation
Formation des agents techniques et des producteurs en techniques de compostage et en CES. Les thèmes de formation porte principalement sur:
- la technique de construction de fosse compostière
- Les techniques de compostage
- le Zaï mécanique et autres techniques CES.

Le public cible est constitué des membres de ces groupements qui seront impliqués dans un cadre collaboratif avec les Directions Provinciales de l’Agriculture de l’hydraulique et des Ressources Halieutiques des zones concernées.

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Evaluation et impact

- Evaluation agronomique et économique des techniques de gestion intégrée de la fertilité des sols dans les systèmes sorgho-mil /niébé dans les zones du Bazéga et du Yatenga.
- Évaluer la maîtrise par le public cible des techniques de gestion intégrée de la fertilité des sols dans les systèmes de culture à base de mil/niébé ou de sorgho/niébé.
- Évaluer l’impact des techniques de gestion intégrée de la fertilité des sols sur la sécurité alimentaire et l’amélioration des revenus des producteurs particulièrement sur la vie des femmes.

Facteurs de succès ou d’échec

Le temps de travail et la pénibilité du zaï constituent une contrainte à la vulgarisation de la pratique. C’est pourquoi il est prévu le zaï mécanisé. Cela nécessite la formation et l’appui des producteurs pour s’approprier la technique et les outils. Les contraintes climatique et biophysique sont telle que le bénéfice des techniques proposées est certain.

Avec le dynamisme des Organisation paysannes dans les zones ciblées on peut s’attendre à;
- Une amélioration du taux de couverture des besoins alimentaires des producteurs
- Une amélioration des conditions de vie des producteurs.

Possibilité de transfert

- Les techniques de gestion intégrée de l’eau et des nutriments dans les systèmes de culture à base de mil et sorgho sont adaptables à toute la zone semi-ariée d’Afrique au sud du Sahara. Pour peu qu’un minimum de savoir faire et minimum d’équipement soient assurés les résultats et l’impact sur la vie des producteurs sont positifs.

Références


Context and genesis of the practice

Cropping Systems
Bazega and Yatenga Provinces are located respectively in South-Central and North-western regions of Burkina Faso. In these zones, rural population represents 80 to 90% with an average density of 41 inhabitants per square kilometer. Population density per useful agricultural area is very high and reaches 202 inhabitants / Km² in Yatenga province. They are located in the soudano-sahelian climatic zone where the average annual rainfall is between 400 and 800 mm (Somé, 1989). The rainfed cropping season is over June and September and last 120 days in the best case but less than 90 days during dry years.

The cropping system is based on cereals, mainly millet and sorghum. Maize is cropped on 5 to 10% of cultivated area and rice does not exceed 1%. The irrigated crops are rice and maize, market gardening is increasingly important. Crop productions fluctuate very much over years according to annual rain events.

Cereal productions in these zones don’t cover population annual needs of food leading to more or less big deficit according to each year harvest during the cropping season. The deficit is mainly due to soil fertility decline and soil erosion. These areas are characterized by degraded lands as a result of combined effect of water deficiency, human pressure and overgrazing.

Action justification
In the central and northern regions of Burkina, fallow no longer exists so that the traditional cropping system cannot maintain crops yields due to soil fertility decline (Piéri, C., 1989; Sédogo, 1993; César and Coulibaly, 1993). To continue to produce, soil organic matter reconstitution principles and practices have been integrated into cropping systems. In African sub-Saharan kaolinitic soils, many publications have shown that without organic matter, mineral fertilizer alone can not maintain, in the long-term, crops yields and soil fertility because of soil acidification, losses in organic matter content and soil compaction (Sédogo, 1991; Feller, 1995; Ouédraogo et al. 2001; Zougmoré et al., 2002).

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15 INERA, Desert Margins Program, Burkina Faso.
The first objective of integrated soils fertility management is to combine soil and water conservatory methods with soil fertility management techniques in a cropping system ecologically clean, economically viable and efficient. In the project zones crops productions in sorghum and millet based cropping systems didn’t cover in most cases populations needs. To improve cropping systems productivity, increase yields and stakeholders incomes in these regions, it is imperious to consider a more integrated system combining improved variety of millet, sorghum and cowpea, soil and water conservation techniques and the use of inorganic and organic fertilizers. This integrated system in addition to the increase of productivity is stable. Its effectiveness depends on the improvement through training of development agents and farmers ability.

Organization of farmers
Farmers are organized in male and female villager’s organizations, or mixed farmers’ groups.

The Practice description

Innovations to introduce are based on combinations of organo-mineral fertilizers, soil and water conservation technique (zaï), crops rotation and/or cereal/leguminous association, and use of improved varieties.
Mineral fertilizer; NPK, natural Phosphate
Organic fertilizer; manure, compost

The experimental design will be in farmers’ fields. It will comprise treatments combining:
- Water harvesting technique at plot scale (Zaï)
- organo - mineral fertilizer (NPK + manure or compost)
- Crop rotation; sorghum/cowpea or millet/cowpea with the most promising varieties
- Cereal and leguminous association on different seedling line; Sorghum/cowpea or millet/cowpea with the most promising varieties.

Activities of field experiment
Two types of trial are planned:
a) Tests on millet based cropping system ;
Treatment1: Millet-cowpea rotation on zaï + organo - mineral fertilizer
treatment2: millet-cowpea association on zaï + organo - mineral fertilizer
Treatment3: farmer practice in millet based cropping system (control)

b) Tests on sorghum based cropping system
Treatment1: sorghum-cowpea rotation on zaï + organo - mineral fertilizer
Treatment2: sorghum-cowpea association on zaï + organo - mineral fertilizer
Treatment3: farmer practice in sorghum based cropping system (control)

Training activities
Technical staff and farmers training in compost production and soil water conservation (SWC) techniques.
Training themes are mainly on:
- Compost pit building technique
- Compost production technique
- Zaï pit mechanization and other SWC techniques.

The target group is the members of farmers organization involved in the collaborative framework with Provincial Direction of Agriculture minister located in the project zone.

**Annual cost**

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<td>MINOR EQUIPMENT FOR FIELD WORK</td>
<td>500 000</td>
</tr>
<tr>
<td>- Measurement materials</td>
<td></td>
</tr>
<tr>
<td>- Material of tillage and sowing</td>
<td></td>
</tr>
<tr>
<td>- Bag and string</td>
<td></td>
</tr>
<tr>
<td>INPUT</td>
<td>300 000</td>
</tr>
<tr>
<td>- Fertilizer</td>
<td></td>
</tr>
<tr>
<td>- Seeds</td>
<td></td>
</tr>
<tr>
<td>- Pesticides</td>
<td>600 000</td>
</tr>
<tr>
<td>TEMPORAL LABOR</td>
<td></td>
</tr>
<tr>
<td>- Technician</td>
<td></td>
</tr>
<tr>
<td>- Man power</td>
<td></td>
</tr>
<tr>
<td>TRAVEL COST</td>
<td>2 200 000</td>
</tr>
<tr>
<td>- Fuel</td>
<td></td>
</tr>
<tr>
<td>- Subsistence cost</td>
<td></td>
</tr>
<tr>
<td>- Car cost</td>
<td></td>
</tr>
<tr>
<td>OFFICE AND COMPUTER REQUISITES</td>
<td>400 000</td>
</tr>
<tr>
<td>COMMUNICATION COST</td>
<td>200 000</td>
</tr>
<tr>
<td>OTHER COST</td>
<td>800 000</td>
</tr>
<tr>
<td>- Farmers Organization supporting cost</td>
<td></td>
</tr>
<tr>
<td>- Training</td>
<td></td>
</tr>
<tr>
<td>TOTAL</td>
<td>5 000 000</td>
</tr>
</tbody>
</table>

**Assessment and impact**

- Economical and agronomical evaluation of integrated management of soil fertility in sorghum - millet / cowpea cropping system in Bazéga and Yatenga zones,
- Assessment of the target group capacity and skill in integrated soil fertility management techniques in millet/cowpea or sorghum/cowpea cropping systems.
- Assessment of the impact of integrated soil fertility management techniques on food security, improvement of stakeholders’ income and particularly on women live.
Factors of success or failure

Time consuming and hardness of zaï technique is a constraint for farmer during its practice. It is why zaï mechanization is proposed. That necessitates farmers training and a support to appropriate the technique and tools. Biophysical and climatic constraints are such as proposed technique benefit is sure.

Farmers Organization dynamism in the targeted zone is a base to expect;

- An improvement of farmers need of food coverage rate
- An improvement of farmers’ livelihood.

Possibility of scaling up

Integrated management of soil nutrients and water conservation technique in millet and sorghum based cropping systems are usable in all the semi-arid zone of in West Africa. If a minimum of knowledge and equipment are insured the positive results and impact on stakeholders’ life can be reached.

References


Title of Best Practice: Small holder Bean (Phaseolus vulgaris L) Seed Production and Dissemination System

Country: Malawi

Authors: C. M. Masangano

Category of Practice: Seed production and distribution systems

Context and Genesis

Description of the Production or Service System
Just like other grain legumes, there is no organised system for the production and dissemination of bean seed in Malawi. This project aims at making seeds of improved bean varieties more readily available to smallholder farmers. This is achieved by conducting seed multiplication using smallholder farmers using various forms of irrigation during winter season then selling the seed to other farmers for rain-fed crop production.

Description of Social, Economic and Institutional Context
The programme is working with low income smallholder farmers who operate very small land holding sizes. Their land holding sizes are in most cases less than 1 hectare and the land they use is under customary land tenure system under the custodianship of traditional chiefs. The farmers are organised into groups and are assisted by staff of Bean/Cowpea Collaborative Research Support Program (CRSP) at Bunda College of Agriculture and various non governmental organisations.

Problem that was to be Tackled
Malawi has two bean research programs including Bean Cowpea Collaborative Research Support Program (CRSP) funded by USAID and Bean Improvement Program (BIP) by CIAT. Bean/Cowpea CRSP works with researchers from the University of Malawi, Bunda College of Agriculture while Bean Improvement Program works with the Department of Agricultural Research Services based at Chitedze Research Station. These research programs have developed a number of varieties (17 varieties) but most of these varieties have not been widely disseminated among farmers. The major bottleneck being that the country has no formal seed systems for grain legumes. Private seed companies do not find grain legume seed production as profitable enough since farmers can recycle their seed for several years without experiencing major decline of seed quality. This creates a problem of unreliable market for the private seed companies and as a result the companies have not engaged in legume seed production. Grain legumes such as beans are on the other hand important food crops which make a major contribution to their protein intake and are also good sources of cash income.

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17 Faculty of Development Studies, Bunda College of Agriculture, Lilongwe, Malawi
Organizations and Stakeholders Involved
The Seed Multiplication Component of the Bean/Cowpea CRSP at Bunda College of Agriculture decided to collaborate with several NGOs and in some cases directly with smallholder farmers to engage in seed multiplication and dissemination. The NGOs involved include Total Land Care, Concern Universal and Action Aid.

The Practice

Innovations and Changes Introduced
Bean/Cowpea CRSP at Bunda College develops various bean varieties through its breeding activities. The varieties that have been developed include, nasaka, bwenzilaana, namajengo, chimbamba, Bunda 93, kanzama, kantsilo, and saplelekedwa. Two of these varieties, kalima and nasaka have been widely promoted through seed multiplication and dissemination activities described above. These varieties were chosen because of a number of varietal characteristics that they have including:

- Both varieties are early maturing and become ready for harvest at a time when most smallholder farmers are experiencing food shortage. Because of this, the varieties play a very important role of mitigating the impacts of food shortages since farmers either sell the bean and use the money for buying food or eat the beans directly.
- Both varieties are fast cooking and therefore consume less fuelwood. Firewood is a major constraint in Malawi and fast cooking is therefore a very important characteristic in beans.
- The varieties (especially kalima) are very high yielding. Kalima can give yields as high as 3000 Kg/ha while nasaka can give yields of up to 1500 kg/ha.
- They are both very palatable.
- They are large seeded (45g/100 seeds for kalima and 49g/100 seeds for nasaka). Farmers in Malawi like large seeded bean varieties partly because they sell their beans by volume and large seeded varieties command more money.
- Kalima bean variety is tolerant to most diseases and pests.
- Both varieties have a dwarf growth habit.

Main Activities Undertaken
The Seed Multiplication Component of the Bean/Cowpea CRSP at Bunda College produces foundation seed of kalima and nasaka. This seed is sold to NGOs and some of the seed is directly sold to smallholder seed producers around Bunda College of Agriculture. The NGOs distribute the seed to smallholder seed producers in small packs such as 5kgs in their areas of jurisdiction. Before the seed is distributed, the fields of the seed producers are inspected and those seed producers who have registered for the first time are trained in seed production techniques. The seed producers multiply the seed making sure that all sanitary and inspection requirements are followed. When they have produced the seed, they are encouraged to keep enough seed for their commercial crop and they sell the rest to other farmers. Some of the NGOs like Total Land Care actually buy back the seed and distributes it to other farmers who grow it as a commercial crop.
Resources Required
The program requires a constant supply of adequate amounts of foundation seed as well as other inputs such as fertilizers and chemicals. There is need to provide credit to assist farmers to access these inputs. One bottleneck which limits farmers from participating in this program is lack of irrigation equipment such as treadle pumps.

Main Stakeholders
Smallholder farmers, Bean/Cowpea CRSP staff at Bunda College of Agriculture (botht breeders and staff of the Seed Multiplication Component, staff of the Seed Inspection Unit of the Ministry of Agriculture, NGOs and private traders.

Intended Target Groups
Smallholder farmers

Assessment and Impact

Why was the Practice Considered Successful
The program can be considered successful because of a number of reasons:

- Farmers are able to increase the amount of seed tenfold on average as table 1 below shows.
- Secondly, the program has helped low resource farmers to make money as the table shows. On average farmers around Bunda College of Agriculture made over MK12,000.00
- The program has helped farmers access improved varieties with superior traits as compared to local varieties. From table 1 below, it can be observed that most of the farmers did not sell all the crop they harvested. They kept some for food as well as for seed.
- Most of the farmers that have been involved in the project are very interested to continue with the project
Table 1: Smallholder Bean Seed Multiplication under Irrigation in Winter Season of 2004 Around Bunda College of Agriculture

<table>
<thead>
<tr>
<th>Name</th>
<th>Area</th>
<th>Date plant</th>
<th>Seed issued</th>
<th>Harvested</th>
<th>Sold</th>
<th>Income</th>
</tr>
</thead>
<tbody>
<tr>
<td>VH. Mdindo</td>
<td>0.2</td>
<td>12-Jun</td>
<td>15</td>
<td>345</td>
<td>200</td>
<td>20,000</td>
</tr>
<tr>
<td>VH Khombe</td>
<td>0.2</td>
<td>14-Jun</td>
<td>30</td>
<td>354</td>
<td>150</td>
<td>15,000</td>
</tr>
<tr>
<td>VH. Chimtuyange</td>
<td>0.2</td>
<td>14-Jun</td>
<td>30</td>
<td>433</td>
<td>350</td>
<td>35,000</td>
</tr>
<tr>
<td>Kaphala</td>
<td>0.2</td>
<td>15-Jun</td>
<td>18</td>
<td>336</td>
<td>250</td>
<td>25,000</td>
</tr>
<tr>
<td>J. Ngwangwa</td>
<td>0.2</td>
<td>15-Jun</td>
<td>40</td>
<td>156</td>
<td>50</td>
<td>5,000</td>
</tr>
<tr>
<td>Mpamila</td>
<td>0.2</td>
<td>20-Jun</td>
<td>13</td>
<td>85</td>
<td>0</td>
<td>-</td>
</tr>
<tr>
<td>Kelementi</td>
<td>0.2</td>
<td>20-Jun</td>
<td>23</td>
<td>535</td>
<td>400</td>
<td>40,000</td>
</tr>
<tr>
<td>Diniwa</td>
<td>0.2</td>
<td>20-Jun</td>
<td>14</td>
<td>176</td>
<td>100</td>
<td>10,000</td>
</tr>
<tr>
<td>Marichi</td>
<td>0.2</td>
<td>20-Jun</td>
<td>30</td>
<td>196</td>
<td>100</td>
<td>10,000</td>
</tr>
<tr>
<td>Mandaliza</td>
<td>0.2</td>
<td>25-Jun</td>
<td>20</td>
<td>223</td>
<td>150</td>
<td>15,000</td>
</tr>
<tr>
<td>Mkanthama</td>
<td>0.2</td>
<td>30-Jun</td>
<td>15</td>
<td>43</td>
<td>0</td>
<td>-</td>
</tr>
<tr>
<td>Henry Thauka</td>
<td>0.2</td>
<td>40</td>
<td>235</td>
<td>200</td>
<td>20,000</td>
<td></td>
</tr>
<tr>
<td>VH. Mkanda</td>
<td>0.2</td>
<td>2-Jul</td>
<td>10</td>
<td>95</td>
<td>50</td>
<td>5,000</td>
</tr>
<tr>
<td>Magodi</td>
<td>0.2</td>
<td>2-Jul</td>
<td>12</td>
<td>188</td>
<td>150</td>
<td>15,000</td>
</tr>
<tr>
<td>Kamtogo</td>
<td>0.2</td>
<td>3-Jul</td>
<td>20</td>
<td>69</td>
<td>34</td>
<td>3,400</td>
</tr>
<tr>
<td>Kainja</td>
<td>0.2</td>
<td>3-Jul</td>
<td>10</td>
<td>58</td>
<td>0</td>
<td>-</td>
</tr>
<tr>
<td>Siyeni</td>
<td>0.2</td>
<td>7-Jul</td>
<td>12</td>
<td>80</td>
<td>0</td>
<td>-</td>
</tr>
<tr>
<td>Totals</td>
<td>3.4</td>
<td></td>
<td>352</td>
<td>3607</td>
<td>218</td>
<td>218,400</td>
</tr>
</tbody>
</table>

Note: Price was a fixed 100/kg
Evaluation of Benefits
Some of the benefits are as shown above. Initial results of a study to assess the impact of the seed multiplication program are provided below. Please note that these results pertain to those farmers who worked with Concern Universal alone. More results are yet to be analysed.

1. The major problems that the seed multiplication farmers experienced are
   - Some farmers did not receive seed after preparing their gardens due to shortage of seed and the farmers perceived this as great inconvenience.
   - The 5kg bean seed which they received was very inadequate and as a result there production was limited.
   - The seed was received very late, they got it in December while they normally plant beans in November in that area.
   - Some plants were drying and they thought they were being attacked by some underground pests but they never found insect pest attacking them.
   - Due to their late planting, the seed was affected by a dry spell.
   - They need to have a reliable market rather than relying on private traders who buy their crop at very low prices such as MK15/kg. The same private traders sold the seed back to the farmers at MK60/kg at planting time.
   - For the commercial crop, the farmers normally experience seed shortage.

2. The respondents felt that the following aspects of their seed multiplication program needed to be changed
   - Seed should be distributed as early as October so that they be able to plan how much land to reserved for the seed multiplication program.
   - Those who are not going to get the seed need to be advised in advanced so that they be able to used their land for other alternative purposes.
   - They also want to be receiving seed for winter seed production under irrigation.
   - They would like to be issued seed of several varieties so that they are able to compare their performance
   - We should hold on to the bean seed till we get good prices.

Most Significant Impacts
- The program has helped low resource farmers to have a source of income.
- The program has helped farmers access improved varieties with superior traits as compared to local varieties.

Factors Contributing to Successes and Failures

Problems Encountered and Solutions Found in Implementing the Practice
The major problem requiring serious consideration is marketing. The smallholder seed producers involved are very resource poor farmers who would like to sell their seed immediately they have harvested their crop. This is usually not the case. In most cases, farmers have to wait for 4 to 6 months after harvest before buyers come to buy the seed. The farmers can not wait that long and they end up selling the seed to vendors at very low prices. Some even oversell and then go back to the vendors to buy the same seed at very high prices.
One suggested solution to this problem would be to create a revolving fund which could be used for buying back the seed from farmers and storing it until a good market is identified. This would ensure that farmers are getting the right prices and that the seed is not lost to consumers who buy it for consumption. A fund of about $1000,000.00 can be a good starting point. Such a fund would need to be managed by an NGO, which could be vested with the duty to coordinate marketing activities of bean and other legume seeds in the country.

**Key Driving Forces in Managing Change**

Main reasons identified practices contributed to success (or failures), possible factors can be classified as:

- More internal, e.g.: how were activities undertaken, such as types of training, specific methodologies used, specific skills required to implement them (new/additional resources)
- Organizations and champions who were essential to its success (what was special about them)
- Local, more external conditions: social and environmental, e.g. community conflict, local political interests, etc
- Wider context/conditions: unfavourable policies, suitable national level support institutions, macro-economic environment, etc

**Opportunities for Mainstreaming and Scaling-Up**

Suitability for Scaling-Up to Others in Rest of Country, or for Extrapolating to Other Countries

The program is very suitable for scaling up to the whole country and also to include all other grain legume seed since they all experience similar problems. The program would benefit most if the idea of the revolving fund is adopted and seeds of most legume crops included.

Risks Associated with Scaling-Up

Malawi has been experiencing frequent droughts. Ironically, such droughts have tended to affect maize (the main staple) more seriously than legumes. Early maturing beans like the ones discussed here tend to escape such droughts and scaling up a program of this nature would benefit farmers a lot in terms of food security.
Title of Best Practice: Rescuing of the food and agricultural production of the native potato framed in the Productive Innovation Network of the Potato - Red de Innovación Productiva de la Papa (RIP-PAPA)\(^{18}\)

Country: Venezuela, Rangel Municipality of The Andes Region

Authors: Liccia Romero\(^{19}\), Caroly Higuera\(^{20}\), José Aguilar, Micheline Bouerim\(^{21}\), Elvira Ablan\(^{22}\)

Category of Practice: Multi-stakeholder allianceing\(^{23}\).

Context and Genesis

Description of the Production or Service System

The National Productive Innovation Networks (RIP), are participation spaces created by the Science and Technology Ministry, in which the organized community, public and private enterprises, knowledge centers and other institutions play equally important roles. This with a purpose of improving competition and launching development through the exercise of local potential. The RIP’s are part of a new policy introduced by the Science and Technology Ministry heading for to the action of science and technology in Venezuela through the Innovation Regional Systems (SRI). The SRI’s surge out as a product of the junction of interests coming from different entities from the same region in order to generate interrelationships that would allow a common learning in the region.

The SRI’s are based on a shared values system, a productive culture, an active participation of the communities and a financial structure (Aguilar and Blanco, 2004). Particularly in Mérida State, the Foundation for the Development of Science and Technology (FUNDACITE) assumed this job by supporting the working initiatives on products with comparative advantages. One of these products, because of its importance in Merida State and in a national scale, is the Potato around which the Productive Innovation Network of the Potato (Red de Innovación Productiva de la Papa) RIP PAPA, localized in one of the main productive municipalities in Merida State named Rangel, and its capital Village Mucuchies. The Network’s main purpose is the launching of the sustainable growth of the high Phyto-sanitary quality Potato production in Rangel Municipality in Merida State. The primary strategy to reach this goal is providing the producers with the adequate knowledge about the production of high resistance Potato seed to reduce the dependence on imported seed. The main reached goals by RIP PAPA at this stage are:

\(^{18}\) IFAD Supported Case Study
\(^{19}\) Instituto de Ciencias Ambientales y Ecológicas, Universidad de Los Andes.
\(^{20}\) Asociación Productores Integrales del Páramo, (PROINPA)
\(^{21}\) FUNDACITE Mérida - Ministerio de Ciencia y Tecnología.
\(^{22}\) Centro de Investigaciones Agroalimentarias Universidad de Los Andes
\(^{23}\) Inscription in a frame of growth of the local social networks and a new public policies concept, which will facilitate the participation of local performers and the constitution of alliances between public and private organizations and the common. This experience, its goals and achieved objectives will act as a base for spreading such alliance towards the most isolated and depressed social sector such as the Native Potato farmers.
• The creation of a Pilot Unit for the production of High Quality Pre basic category Potato tubercles, with the construction and starting out of a pre basic seed multiplication unit or winter house with an approximately five hundred square meters size (500 m²).
• The establishment of a plan for integral management of Potato seed plots for guarantying the crop’s sustainability.
• The strengthening of the Vegetable tissues cultivation Laboratory belonging to INIA Merida heading to the increase of the vitroplants and micro tubercles production for producers use.
• Enabling Producers, technicians, agricultural facilitators and integral crop development experts in agricultural matters.
• Creation of a connecting network between the different institutions taking part in the proposal.
• Development of a data base in order to manage matters of planning, planting, commercialization, economical evaluation and technical and administrative pursuit of the project.

During September 2005, RIP PAPA undertook the challenge of incorporating among its goals and expected influence range for 2006, the rescuing of the agricultural and nutritious cycle of the native potato which had been lost during the agricultural modernization process in the Venezuelan Andes.

To fully assume this challenge, RIP PAPA has extended its associates Network towards the producers the still keep the native Potatoes, as well as other academic institutions that work with the issue of the recovering of this resource of biological and cultural importance.

Description of Social, Economic and Institutional Context
The high valleys of the Venezuelan Andes were scenario of a strong change in agriculture, especially from 1960’s. This change involved the use of the land, technology, agrarian structure, organization of production, marketing and living conditions. The dynamic behind these changes came from the national socio-economic system characterized by features such as the growth of the petroleum industry and the reinvestment of oil income in modernizing agriculture, urban growth, migratory movements and changes in eating habits in the main urban centres (Velásquez, 2003). The Mucuchies region is part of these changes in the high Venezuelan Andes with an agriculture intensification based on potato growing. Since the 1970’s diverse organizations that combine economic, social, cultural and environmental goals were created together with working networks operating between them. They bring answers to local needs and aspirations, and represent social innovations for the nature of their activities, their organisational structure and style of management (Richer, 2005). In the year 2000 new public policies come out supporting local development and cooperation, signifying new development opportunities for social organizations. PROINPA and CEPDIF, are two social organizations located in the Paramo in Merida that have incorporated themselves to the fair use of such opportunities, particularly in the participating and accessing to public founds that correspond to the RIP PAPA.
Problem/Issue to be Tackled
Potato growing in The Venezuelan Andes is a specialized agro-ecological and socio-economic niche, which was successful in intensive production and in taking part of the national economy. However for various reasons this niche has disappeared or is no longer viable and the production system is technically and environmentally inefficient. The reason for this lack of viability was found in (Romero, 2003):

- Non sustainable technologies,
- Non viability of agro-ecological procedures: exhausted soils, low diversity, particularly with regard to potato seed
- Pressures from policy change and market conditions
- Population pressures in a context or growing inequality

Intensive and modern agriculture in the Venezuelan Andes had as consequences first, the dependence on imported seeds, which represents a high cost for the poorer farmers, then the serious genetic erosion of the native Potato and the exclusion of the farmer population that still works with it.

The incorporation of RIP PAPA to this agricultural sector is one step towards a greater equality in the participation and access to state resources by the farmers and the poorest producers, as well as an important contribution towards strategic aims of productive diversification, feeding security and rescuing of the National genetic heritage.

Organizations and Stakeholders Involved in its Conception and Design
Local NGO’s: Paramo Integral Producers Association, Education Center for the Integral Formation of the Family (CEPDIF) and Peasant Centre El Convite.

Government Organizations: Science and Technology Ministry: FUNDACITE Merida, National Institute of Agricultural investigations (INIA) and Major Hall of Rangel Municipality.

Universities: University of Los Andes: Ecological and Environmental Sciences Institute, Agro-feeding investigations Centre; National Experimental University of Yaracuy: Agro-feeding investigations Group, Gastronomic Investigations Centre.

The Practice
Description of the Innovations or Changes Introduced
Elements of Innovation and technological development were introduced as indispensable for the local production of the high quality seed such elements were the installation of an automatically controlled greenhouse for the production of tubercles-potato seeds, equipped for Tropical Highland conditions. Additionally, an investigation and technological development Unit was created within the Producers Association PROINPA, which creates a connecting network between the different associate institutions in the proposal it develops a data base for the management of the project and connects PROINPA in Mucuchies village with other institutions through the Net.
Main Activities Undertaken
1. A study of the different technological options and a decision about the purchase of the greenhouse
   1.1) Installing of the greenhouse
   1.2) Providing the greenhouse with equipment for the production of the potato seed
2. Creation and strengthening of investigation and technological development centres
   2.1) Strengthening of the Negotiation centre of the Paramo Integral Producers Association PROINPA
   2.2) Strengthening of the Vegetable tissues cultivation Laboratory
3. Enabling producers with specialized technical assistance
   Courses and workshops were dictated about the following themes:
   3. Management of potato sprouts for the pre-basic potato seed under greenhouse conditions.
   4. Integral management of potato seed plots.
   5. Formation of seed inspectors.
   6. Rural Participative Sounding (RPS).
   7. Environmental Education.
   9. Weeds Control
   10. Organizational strength
   11. Fertilizing and Irrigation systems

Resources Required
The total cost of the project until 2004, was calculated in 87,000 USD (181,496,904,00 Bs.), which was partially subsidised by the Science and Technology Ministry (FOANCIT) with 58,000 USD and the rest was given by the institutions (INIA, Rangel Major Hall). For the new incorporation stage of the rescue of the native Potato, the costs and required resources are still being studied.

Main Stakeholders and Actors in Implementation and in Outcome
The main actors for the performance of the RIP PAPA were the Paramo Integral Producers Association (PROINPA), Foundation for the Development of Science and Technology (FEUNDACITE-Merida) and the National Institute of Farming and Stockbreeding Investigations of Mérida State (INIA Mérida)
Main Intended Target Groups
The main beneficiary of the RIP PAPA are the small and standard producers of the Rangel Municipality of Merida State, the use of a high quality seed from a genetic and sanitary point of view with a good economical and agricultural management, will rise the output to an average of thirty tons per hectare and will reduce the production cost in a 25.48%

The impact on the seed producers is revealed by an improvement in their lifestyle showed by the possibility to structure a sustainable productive system, connected to a local and furthermore to a National market.

Assessment and Impact

Why was it Considered Successful
In the 1980’s the producer’s organizations that were in charge of the production and self supply capacity for seed acquisition in the Venezuelan Andes, had an adverse context in economical and political matters. The context led these institutions to failure and disbanding. During 2004, the pressure before the public opinion that PROINPA and FUNDACITE, allowed the skipping of several bureaucratic obstacles for the RIP PAPA to achieve its aims for the first stage and motivate itself to continue spreading its action area towards the peasants that keep the native Potato.

Evaluation of Benefits
The principal recipients of these advantages are the small producers as they have the possibility to obtain the certified national potato seed at a lower price than the imported one. These small producers only have access to an old and contaminated seed at the moment, and it causes the raise in the production costs, lowers the output and acute the need for agro-chemicals, damaging the peasants health and the competitiveness of their products. With the locally produced and certified seed it will be possible for the Mucuchies small producers to improve their competitiveness and begin to produce with a minor aggressiveness toward the environment. The rescue of the agricultural and nutritious cycle of the native potatoes will give many opportunities to the poorest farmers who live in fragile mountain areas ecologically wise that also represent strong climatic limitations for the agricultural production. Returning a Cultural and economic value to a product of their own will improve their life conditions without the need to join an intensive agriculture which is environmentally negative.

The potential losers under the success of the RIP PAPA will be the seed and potato importing enterprises, which earn around 200 million USD annually.

If this could be documented: what were the most significant impacts in terms of poverty alleviation, food security and poor people’s livelihoods?

The production of certified seed and a diversified trade of commercial and native varieties will allow the independence from imported seeds guarantying the nourishment security, as it brakes the vulnerability of the current productive system, which is dependent on a single potato variety (Granola), highly susceptible to plagues and diseases as well as highly risky before the environmental changes, characteristic of these regions.
### Significant Outcomes

The handicap label on the national capacity for self supply of potato seed. Furthermore, it is being demonstrated with practice that financial support, capacitating and a concrete inter institutional management, it is possible to carry out sustainable solutions for self supply coming from the producers themselves. The action of the Producers organizations framed by the RIP PAPA has managed influence credit and agriculture financing policies (specifically FONDAPFA), which from now on will have credit programs with specific profiles (amounts, credit and payment conditions) that will benefit the potato seed production.

### Factors Contributing to Successes and Failures

#### Problems Encountered and Solutions Found in Implementing the Practice

One of the main problems to carry out the proposals of the RIP PAPA is in the low supervising capacity on the seed crop fields belonging to the official institution in charge of the certification, called National Seed Service (SENASEM). This institution has a single one functionary in charge of inspections, this functionary alone is not able to make an efficient inspection of all farms and the potatoes could ripe on the field waiting for the inspection. Because of this reason and for extending this capacity, an educating and formation process was initiated in order to enable seed inspectors. In spite of that these are still to be recognized or accepted by SENASEM as legally capable of certification entities.

#### Key Driving Forces in Managing Change

The key driving force is PROINPA’s perseverance; this association is under a young leadership with technical and professional knowledge which is also compromised with the social, environmental and economical aims of the project. As well the political changes given in Venezuela are very important as a driving force, because an institutionally legal basis has been created to promote the organization and people’s participation, specially the poorest, as well as the promotion of a social and integral economy. This legal and political context has given impulse and acting spaces that allow PROINPA and the PAPA NETWORK to defeat the resistance to a change from a representative democracy towards a participative one as the constitution of the Bolivarian Republic of Venezuela (1999) reads. This context is the one in which the influence of the potato importers on government decisions could be defeated.

#### Main Reasons Contributing to Success or Failures

Internal conditions: To go successfully forward rescuing the agricultural and nutritious cycle of the native potatoes, there are lots of work to be done considering the following aspects:

- Organization of the producers that keep the native potato.
- Recovering of the native potato crops and the diffusion of ecologically and socially sustainable agricultural practices.
- Recovering and gastronomic re introduction of the native potatoes in a local and national scale.
- Processing possibilities and industrial transformation of native potatoes.
- Investigations about attributes and value of the native potatoes.
- Private and state commercialization Networks.
Local more external conditions: A favorable aspect for the recovering of the native potatoes is the character of the Andean peasantry, very open and given to exchange. In the same way, the intervention of working groups from the University of Los Andes, institution that inspires confidence to the peasants, will help the evolution of this new stage of the RIP PAPA. The success achieved by other productive innovation networks (Tourism and Wool production) also located in the Andean Highlands represent an important support for the aims of recovering the native potatoes.

Wider context/conditions: A possible unfavourable element is the delay in the diffusion and acceptance of technological changes in the potato crop management with environmental aims (such as the exclusion of highly toxic biocide products and the use of biological controllers, bio fertilizers, etc.). On the other hand, in a national scale, it is necessary to hold a re education of the consumer towards balanced eating habits that would also show a coherence with an estimation and cultural identification elements. In a last instance the continuity of social inclusion policies, social reinvestment of the oil rent and support to the social integral economy, depend on the democratic stability in Venezuela, which finds itself threatened by obvious factors within and outside the country.

Opportunities for Mainstreaming and Scaling-Up

Suitability for Scaling-Up
This case is appropriate to be extrapolated as a model within a municipal scale, given the role that the Rangel Municipality Major Hall played as mediator and facilitator for the political viability of the PAPA NETWORK. The Rangel Municipality was recently elected as one of the “showcase municipalities” to orientate the municipal work in the rest of Venezuela.

Risks Associated with Scaling-Up
The benefits of repeating this experience in the political, environmental and economic aspects, get over any risk. The potato production has been concentrated in the Venezuelan Andes, given the agro-ecological conditions, and the agrarian vocation of its people. The niche of the potato is not found in the rest of Venezuela.

What has to be Done to Promote it Elsewhere Successfully
The experience exchange with other social organizations of the country is one of the pathways for these kind of experiences to repeat themselves.

References


