

TERMINAL EVALUATION

**THE PROJECT ON TECHNOLOGY DEVELOPMENT
FOR
REVEGETATION AND UTILIZATION OF DEGRADED
AREAS IN THE SEMI-ARID REGION
OF THE NORTHEASTERN BRASIL**

(CAATINGA PROJECT)

**Japan International Cooperation Agency
JICA Brazil**

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CAATINGA PROJECT

Final Evaluation Summary

I – Outline of the Project	
Country: Brazil	Development of revegetation techniques and utilization of degraded areas in the Semi-arid (Caatinga) region of Northeastern Brazil.
Issue: Sustainable Development	Cooperation scheme
Division in charge: JICA in Brasília;	Total cost: 138.358.000 yens
Period of Cooperation	R/D: August 22, 2002 Extension: September 1 st , 2005 to October 31, 2006 F/U: N/A
Support organization in Japan: Totori University Brazilian Organization: UFERSA (Semi-Arid Agricultural Federal University) and IDEMA (Institute of Economic Development and Environment)	
Related Cooperation.	Mini-Project on the Conservation of Sand Dunes and Desertification Control in the Federative Republic of Brasil (1997-2000)
<p>1) Background of the Project</p> <p>In “Caatinga region” there are areas with very different rain precipitation levels. They go from 1500mm in the coast to 400mm in the hinterland.</p> <p>Anthropological activities in semi-arid regions happened even in very dry areas where chopping of native bushes to supply fire woods to ceramic industries added to environmentally unsustainable animal raising produced severe ecological problems.</p> <p>To cope with such issue the Brazilian Government request technical cooperation of the Japanese Government to develop work geared to regeneration of degraded areas, desertification control and identification of forages fitted to the soil of the region.</p> <p>The Japanese Government analyzed the proposal and sent a preliminary study mission in November, 2001. Both Governments agreed upon what should be the project scope and signed M/M for it in August, 2002.</p> <p>After bureaucratic arrangement, as visa for Japanese long term specialist had been settled down, the project activities started effectively in November, 2003.</p> <p>In the terminal evaluation of March 2005, it was recommended to postpone the end date of the project due to delay in the dispatch of long term experts, for 1 year and 2 months behind the schedule. It was decided, as a result, to extend the project until October 31, 2006 to complete the planned activities.</p> <p>2) Project overview</p> <p>Train Brazilian technicians to develop research to regenerate “Caatinga” ecosystem degraded areas using native trees and bushes species in order to reduce poverty in rural communities.</p> <p>2.1) Overall goal Appropriated technologies for degraded areas regeneration, utilizing useful trees and bushes species, are disseminated in Semi-arid region of Rio Grande do Norte State (RN).</p> <p>2.2) Project Purpose Appropriated technologies for degraded areas regeneration, utilizing useful trees and bushes species, are available in Semi-arid region of Rio Grande do Norte State (RN).</p> <p>2.3) Outputs</p> <ul style="list-style-type: none"> ○ The general situation of vegetation and soil uses in Semi-arid region of Rio Grande do Norte State is clarified. ○ The general situation of domestic animal raising in Semi-arid region of Rio Grande do Norte State is clarified. ○ The natural aspects, including vegetation and degradation, in pilot plot are clarified. ○ Trees and bushes species from pilot plot, potentially useful to local communities are selected. 	

<ul style="list-style-type: none"> ○ Revegetation techniques (seedling production, planting and care taking of selected trees and bushes species) in pilot plot are developed. ○ Forages sustainable production techniques, using original and revegetated vegetation are developed. 		
2.4) Inputs:		
From Japanese side:		
Long term specialist	01	Equipments 30.6 million yens
Short term specialists	09	Operational costs 22.9 million yens
Training in Japan:	7	
From Brazilian side		
Counterpart		
Full time	2	
Part time	14	Local costs 690.000 yens
Facilities		
Office space	48m ²	
Laboratories	60m ²	
Animal facilities	40m ²	
Other		
Pilot plot	9 ha.	
II – Evaluation team		
JICA Brazil Office		
Mr. Clóvis Nobre de Miranda – Consultant		
Period of Evaluation	07/14/2006 – 30/11/2006	Type of Evaluation: Final
III – Results of Evaluation		
1-General Consideration		
1.1-Considers-itself Objective of the Project reached, therefore:		
-Even if incipient, Counterparts of the Project are perfecting activities of researches from knowledge transfered by the Project. Development of portfolio of <i>forrageiras</i> (a forage plant) native from technologies of experiments of digestibility animal transfered by the Japanese expert, public presentation of meteorological facts obtained by the Station Meteorological donated by the Project and orientation including Monographs publication to the finalists of the University are some of the examples. Flat annual of development of research are being developed, in some article are obtaining to outline flat biennial.		
- Booklet and Manuals gradually are being concocted after term of the Project, being expected diffusion of result of the Project for researchers, extensions and farmers.		
1.2-The project outputs were attained. Any manuals were produced after finish of Project.		
2 – Summary of Evaluation Results		
2.1 – Relevance		
The Overall Goal and the project purpose are relevant with overall ODA policies of Japan in accordance with “Official Development Assistance Charter”. They are also relevant with Japanese ODA policies for Brazil. They are also in accordance with needs of counterpart organizations.		
2.2 – Effectiveness		
After everything been considered (the time length of the activities, the work conditions, the timing and operational issues) it is possible to say the objectives were attained. The continuity of the research efforts is necessary. To develop revegetation technique in “Caatinga” ecosystem natural conditions needs a timeframe equivalent to the rain precipitation oscillation cycle (around 10 to 12 years).		
2.3 – Efficiency		
There was a temporary low efficiency due to delays. However a recuperation of it happened once investments as specialists, equipments, financing of local activities were done.		

2.4 – Impact

The Project produced very positive externality on UFERSA and IDEMA. IN UFERSA it made clear that commitment and method are essential aspects to a researcher and that research activities must be within the University priorities. IDEMA personnel realized that sustainable development and environment conservation must be based on research and extension.

2.5 – Sustainability

The Brazilian Government documents highlight the importance of degraded areas regeneration although does not show in an objective way how to do it.

The continuation of publication and extension activities are necessary to make project results 1, 2, 3 and 4 auto-sustainable. To do so a strategy must be in place to enhance the technological development processes inaugurated by this cooperation that leaves a partial strategic model at disposal.

IDEMA is already using projects results in his extension activities.

3 – Factors promoting sustainability and impact

3.1 – Factors concerning to planning

- To promote short, medium and long term planning. The project activities are on the way to become part of a state program that is integrated to a regional development strategic plan;
- The project demonstrated the opportunities to integrate activities among institutions with similar objectives;
- The project transferred knowledge related to planning and execution in accordance with natural constraints.

3.2 – Factors concerning to the implementation process.

- Close observation to the timetable and periodic adjustment (quarterly maybe) if needed;
- Programmed in service training and training in Japan at appropriated time.

4 – Factors inhibiting sustainability and impact

4.1 - Factors concerning to planning.

- UFERSA and IDEMA did not put the project among the institutional priorities;
- The lack of project marketing plan within the Brazilians Institutions direct and indirectly related to the objectives.

4.2 – Factors concerning implementation process.

- The delay to make the resources available;
- The UFERSA allocation of personnel inferior to what was planned;
- Close monitoring not good enough due to lack of personnel to do so.

5 – Conclusion

The “Caatinga” project did not attain all results at the end of project (some manuals were edited after end of project) but realized what was feasible within the project design span. The attained results and the research and technology development process established in UFERSA justified the resources invested.

6 – Recommendations

The project activities must continue in order to reach the goal and to consolidate the research euphoria in UFERSA. Some adjustments are necessary:

1. UFERSA should put the project in its budget;
2. A more durable institutional arrangement enveloping IDEMA, UFERSA and others institutions (EMBRAPA,EMPARN, EMATER) concerned with development in “Caatinga” region;
3. The produced technical information must be organized and published;
4. presence would be very helpful since he is a kind of alive archive of the project;

7 – Lessons learned

1. A very careful research of secondary data must be done before to begin any project in order to improve the use of existing data and efficiency.
2. The project activities should be under continuous monitoring to keep it on the track and to allow adjustments.
3. Administrative personnel are as necessary as researchers.
4. The Joint Coordination Committee more presence may give a better status to a project increasing the opportunities for divulgation of results.
5. Any technology development related to natural ecosystem is constrained by the ecosystem determinants. Rain cycle oscillation would be time horizon for revegetation techniques in natural conditions.

8 – Follow up situation.

N/A

終了時評価調査結果要約表

評価実施部署：JICA ブラジル事務所

I. 案件の概要	
国名：ブラジル	案件名：東北部半乾燥地（カアチンガ）における荒廃地域の再植生開発
分野：環境	援助形態：技術協力プロジェクト
所轄部署：地球環境部	所轄課：森林・自然環境保全第二チーム 協力金額：138,358,000 円
協力期間	R/D：2002年8月22日 (延長)：2005年9月1日から 2006年10月31日 (F/U)：無し 先方関係機関：リオ・グランデ・ド・ノルテ州 経済開発環境院（IDEMA）及び 連邦半乾燥地 農業大学（UFERSA） 日本側協力機関：鳥取大学
他の関連協力	チーム派遣：リオグランデドノルテ州半乾燥地における砂丘緑化及び砂漠化防止 (1997～2000)
<p>1. 協力の背景と概要：</p> <p>ブラジル東北部サバナ地帯はカーチンガと呼ばれ、降水量は著しく地域により異なり、南沿岸部1,500mmから内陸の半乾燥地の400mmにわたる気候帯をなしている。</p> <p>雨量の少ない内陸部には半乾燥地が広がっているが、同地域では煉瓦等の製造が盛んであり、原料となる粘土の採掘や煉瓦等の製造に使う燃料用木材の伐採が続いている。また、同地域における無計画な家畜の放牧も植生の後退の一因となっている。</p> <p>このような状況の中、ブラジル政府は日本政府に対し、汚濁地域の回復、砂漠化防止及び現地土壤に適した牧草の確認を主題とする技術協力の要請を行った。</p> <p>日本政府は2001年11月事前調査団を派遣し、2002年8月ミニッツを署名し協力を開始した。専門家ブラジル入国査証取り付けなどの課題を解決し2003年11月に実質的な活動開始に至った。</p> <p>2005年3月実施された終了時評価において、1年2ヶ月間の長期専門家派遣の遅れ等に鑑み、プロジェクトの活動を履行するため遅延期間分の延長が提言され、2006年10月31日まで延長が決定された。</p> <p>2. 協力内容</p> <p>本件協力では原生植物種の活用による農村貧困削減に焦点をあて、カアチンガ生態系システムの荒廃地回復に係る研究開発能力を伯側人員に移転することを目標とした。</p> <p>2.1-上位目標：リオ・グランデ・ド・ノルテ(RN)州の半乾燥地において、有用樹種・草本種を利用した荒廃地復旧のための適正技術が普及される。</p> <p>2.2-プロジェクト目標：リオ・グランデ・ド・ノルテ(RN)州半乾燥地において、有用樹種・草本種を利用した荒廃地復旧のための適正技術が利用可能となる。</p> <p>2.3-成果（アウトプット）：</p> <ol style="list-style-type: none"> 1.RN 州半乾燥地の植生と土壤の利用概況が明らかにされる 2.RN 州半乾燥地の畜産の概況が明らかにされる 3.試験プロットの植生と劣化を含む自然的特色が明らかにされる 4.試験プロットに関連する地域コミュニティにとって潜在的に有用な樹種・草本種が選定される 5.再植生技術(選定樹種・草本種の育苗、植栽、及び管理)が試験プロットでの研究を通して開発される 6.既存植生地及び再植生地双方における持続的飼料生産技術が試験プロットでの研究を通して開発される。 	

2. 4-投入:	
日本側:	
長期専門家派遣: (1)	機材供与: 30.660.200 円
短期専門家派遣: (9)	ローカルコスト負担: 22.982.000 円
	担:
研修員受入: (7)	その他:
相手国側負担:	
カウンターパート配置: (16)	土地・施設: 事務室 (48m ²)、研究室 (60m ²)、パイロットプロット (施設 40m ² 、試験地総面積 9 ha)
ローカルコスト負担: 690.000 円	
II. 評価調査団の概要	
調査者:	JICA ブラジル事務所 ローカルコンサルタント (CLOVIS NOBRE DE MIRANDA 氏)
調査実施期間:	2006 年 7 月 14 日~11 月 30 日 評価種類: 在外終了時評価
III. 評価調査の概要	
1. 実績の確認:	
1. 1-プロジェクト目標については、以下により概ね達成したと判断する。すなわち、	
<ul style="list-style-type: none"> ・ カウンターパートはプロジェクトを通じて移転された技術を活用して現在開発途上とはいえ関連研究の維持発展を行なっている。例としては専門家により移転された家畜栄養消化試験技術に基づく現地飼料混合基準 (これは作成中) や気象観測装置計測データの大学HPでの一般公開などがある。一方今後の研究計画は当面 1 年単位で行なう (場合により 2 年程度のスパンでの計画もある)。専門家の指導により論文多数作成され、一部は学生の卒論指導も行なった。 ・ プロジェクト終了後であるがリーフレット・マニュアル類が作成された。但しこれらを使用した研究者・普及員・農民への成果波及は今後順次進展していくこととなる。 	
1. 2-成果についても、マニュアルなど一部プロジェクト終了後に作成されたものがあるが、概ね達成された。	
2 評価結果概要	
2. 1-妥当性:	
プロジェクト目標や上位目標はブラジルの国家政策やニーズに適合したものである。また、カウンターパート機関のニーズや日本の ODA 大綱、対ブラジル国別事業実施計画にも合致している。	
2. 2-有効性:	
本件協力の置かれた状況 (活動期間、活動環境、活動実施のタイミング) に即して評価すれば協力目標は達成されたといえよう。研究活動の継続が必要である。カアチンガ植生における再植生技術を自然条件に即して確立するためには同地域の年間雨量変動に対応した期間を一サイクル (10 年から 12 年) として、少なくとも 1 サイクルの経過が必要である。	

2.3-効率性：

具体的活動実施の遅延により一時的に低下したが、資金、専門家、機材投入が成されてからは効

率的な実施が行われた。

2.4-インパクト：

IDEMA と UFERSA の活動については大きなプラスインパクトが見られた。UFERSA に関しては、外来植物種導入や外部で開発された技術のコピーに頼らず現地の生態系特色に即した解決策を UFERSA 自身が開発するというイニシアチブを生み出し、UFERSA 構内でこうした現地技術開発に向けた研究部門の設置が見られた。IDEMA については、持続的開発と環境保護の両立には研究と普及の両立が重要であるとの認識が確立された。

2.5-自立発展性

現時点での政府の文書においては荒廃地回復の重要性は記載されていても具体的な対応策は明示できていない。成果 1~4 及びその他技術情報については発行するなど公表し普及活動により実証・自立発展性を確立する必要がある。そのためには本件協力で実施された技術移転により開始された技術開発プロセスの持続を可能とする戦略の確定が必要であるが、本件協力はすでに同戦略のモデル（部分的ではあるが）といえるプログラムを構成しており、IDEMA では普及活動に本件協力成果を活用しつつある。

3 インパクト及び自立発展性強化に貢献した要因

3.1-計画面について

- ・ 長・中・短期計画の推進。プロジェクト活動は州政府プログラムに組み込まれつつあり、同プログラムは地域開発戦略に組み込まれている。
- ・ 目標を共有する機関による共同活動の実施について示唆を与えた。
- ・ 自然制約条件に適合した活動計画・実施管理・モニタリングについての知識が移転された。

3.2-実施プロセスについて

- ・ 活動計画に沿った行動及び定期的モニタリングの必要性がカウンターパートに周知された。
- ・ カウンターパート人材の OJT 実施及び本邦研修について適切な時期に行うことの重要性が周知された。

4 インパクト及び自立発展性強化を阻害した要因

4.1-計画面について

- ・ 国家・州優先事項に取り組むプロジェクトでありながらカウンターパート機関（IDEMA、UFERSA）の優先プロジェクト内に本件協力が取り込まれていなかった
- ・ 関連機関間へのプロジェクトの広報がカウンターパート期間により計画的に成されていなかった。

4.2-実施面において

- ・ 機材投入が計画時期に間に合わなかった。
- ・ UFERSA による人材配置が計画より少人数となった。

人材配員の不足により精緻なプロジェクトモニタリングができなかった。

5. 結論

本件協力は、実施期間中にすべての成果達成には至らなかった(マニュアル作成が一部プロジェクト終了後に持ち越された)が、プロジェクト期間中に実現可能な活動はすべて実施した。達成された成果と UFRSA による研究・技術開発プロセスの確立により、適切な投入がなされたと判断する。

6. 提言

本件協力成果の持続のためには活動の継続は必要であり、このためには下記の注意が必要である。

- ・ 活動は UFRSA 内で正式に内部プロジェクトとして認知され、予算措置を確立する必要がある。
- ・ IDEMA, UFRSA、ブラジル農牧研究公社 (EMBRAPA) リオグランデドノルテ州農業研究公社 (ENPARN)、同州農業普及後者 (EMATER) 間の堅固な協力が必要である。

7. 教訓

- ・ プロジェクト開始事前に関連二次資料を十分精査し、既存の資料を有効活用すること。
- ・ 活動の緻密なモニタリングにより活動傾向・方向の把握と修正が可能となる。
- ・ 事務手続き活動を行う人材の手配は研究者の手配と同様大きな重要性を持つ。
- ・ 合同調整委員会の充実は、プロジェクト成果発表の機会・プロジェクトのプレゼンス強化に役立つ。
- ・ 自然生態系に関連する技術の開発は同環境の制約を受ける。自然条件における再植生技術は雨量の変動サイクルに対応する必要がある。

8. フォローアップ状況

本件協力については、延長 (フォローアップ) は行っていない。

1. Introduction

The baseline of the web of life in planet earth is consisted of energy and water. In the human time scale the energy balance in Northeastern Brazil is very stable while the rainfall occurs in a kind of recurrent cycle. Revegetation technology development timetable should pay attention to that cycle to elaborate the work plan. A good hypothesis is to consider the span of a rainfall cycle as a minimum time horizon for a natural condition revegetation research project

Following that line of reasoning the object of this evaluation should be considered a work in progress. Its original design and even its version after the March 2005 joint evaluation establishes impressive and necessities goals. Expertise, focus, compromise and the right time horizon are the needs to reach the targets.

Those aspects set the scene for the data analysis and data interpretation. The conclusion remarks took into account the five criteria (relevance, effectiveness, efficiency, impact and sustainability) recommended in the “Japan International Cooperation Agency - JICA - Guideline for Project Evaluation” and the implementation process also. The technical recommendations for the continuity of the project are nothing more than ideas for the planning of the follow up phase.

2 - Outline of Evaluation Study

2.1 – Objectives of Evaluation Study

The Terms of Reference highlight two targets:

- Evaluation of outputs based upon the five criteria (relevance, effectiveness, efficiency, impact and sustainability) recommended in the “JICA Guideline for Project Evaluation”; and
- Evaluation of the ability and institutional strengthening of Institute for Economic Development and Environment of Rio Grande do Norte State – IDEMA - and Federal Agricultural University for Semi-arid - UFERSA - to coordinate activities involving several institutions.

Beyond those targets the evaluation should:

- Clarify with the possible precision the cause of the outputs; and
- Extract knowledge from the process and products, useful to support recommendations for future actions.

2.2 – Evaluation Study team

The Evaluation Study was executed by Clóvis Nobre de Miranda, an Agronomist external Consultant, with support from JICA’s office in Brasilia and Project personnel in UFERSA and IDEMA.

2.3 – Period of Evaluation Study

The Evaluation was planned to be realized in two months starting in July, 17, 2006. After the information gathering it became clear that some outputs would be finished after the formal termination of the JICA’s cooperation. As a result of that came out an agreement to extend the period of evaluation to April, 2007.

2.4 - Methodology of Evaluation Study

The methodology was

- The same used in the Joint Evaluation done by the Evaluation Committee on March, 2005 attending what is established by:
 1. The Terms of Reference and
 2. JICA Guideline for Project Evaluation.

The Project Designed Matrix – PDM - considered

- Was the version 3 annex 6 of the Joint Evaluation Report of March, 23, 2005.

The Operation Plan considered

- Was the version 2 annex 7 of the Joint Evaluation Report of March, 23, 2005.
Information collected

1. Objectives and Actions of the state of Rio Grande do Norte State – RN - for its Semi-arid region;
2. Technical communications, papers, reports produced by the Project;
3. Resources delivering and work execution gap;
4. State of availability of the produced technical information;
5. Quality and quantity of and projected outputs attained;
6. The current situation of maintenance, operations and use intensity of the pilot plot, equipments and facilities used by the project;
7. Technical improvement of the Brazilian personnel trained in Japan (participation in workshops, symposium, course, papers produced);
8. Brazilian personnel work plan to follow up the project;
9. Students involved with the project;
10. Number of speeches, seminars, workshops done under the project umbrella;
11. Institutional framework of UFRSA and IDEMA to execute Technical Cooperation Project;
12. Institutional framework of UFRSA and IDEMA for follow up activities;
13. Interaction of UFRSA and IDEMA with institutions direct involved with environment and rural development;
14. UFRSA's level of priority to Research, Development and Extension; and
15. Local communities' knowledge, interest and approval of the project activities and results.

Information analysis and interpretation were conducted in terms of:

- Papers and technical materials written;
- Matching up of the attained and projected results;
- Clarity, objectivity and accuracy of the technical information produced;
- Partial results contribution to the achievement of the objectives;
- Institutional and Researchers level of commitments to the activities geared to the Objectives.

Information gathering strategy

- JICA's bureau in Brasília contact Project personnel to make available the information described in the items 1, 2, 3, 8, 9, 10, 11, 12, 13 e 14;
- Interviews with project personnel (Japanese experts still accessible, and Brazilians), representatives from the local community, professionals from the Research and Extension sectors of UFRSA and IDEMA, students from areas related to the project, participants of seminars, workshops and other activities realized by the Project;
- Field Study on the pilot plots.

3 – Overview of Evaluation Project

3.1 - Background of Project

In “Caatinga region” there are areas with very different rain precipitation levels. They go from 1500mm in the coast to 400mm in the hinterland.

Anthropological activities in semi-arid regions happened even in very dry areas where chopping of native bushes to supply fire woods to ceramic industries added to environmentally unsustainable animal raising produced severe ecological problems.

To cope with such issue the Brazilian Government request technical cooperation of the Japanese Government to develop work geared to regeneration of degraded areas, desertification control and identification of forages fitted to the soil of the region.

The Japanese Government analyzed the proposal and sent a preliminary study mission in November, 2001. Both Governments agreed upon what should be the project scope and signed M/M for it in August, 2002.

After bureaucratic arrangement, as visa for Japanese long term specialist had been settled down, the project activities started effectively in November, 2003

3.2 – Summary of Initial Plan of Project

3.2.1 - Project overview

Train Brazilian technicians to develop research to regenerate “Caatinga” ecosystem degraded areas using native trees and bushes species in order to reduce poverty in rural communities.

3.2.2 - Superior Objective

Technology for utilization of the productive potential of the soil and vegetation from the Semi-arid region (Caatinga) disseminated in the Northeastern Brazil.

3.2.3 - General Objective

Appropriated technologies for regeneration of degraded areas utilizing useful trees and bushes species are available in Semi-arid region of Rio Grande do Norte State (RN)

3.2.4 - Project Objective

To improve the availability of technology suited to regenerate degraded areas using useful trees and bushes species in the Semi-arid region of the state of Rio Grande do Norte.

3.2.5 – Outputs Planned

- The general situation of vegetation and soil uses in Semi-arid region of Rio Grande do Norte State is clarified.
- The general situation of domestic animal husbandry in Semi-arid region of Rio Grande do Norte State is clarified.
- The natural aspects, including vegetation and degradation, in pilot plot are clarified.
- Trees and bushes species from pilot plot, potentially useful to local communities are selected.
- Revegetation techniques (seedling production, planting and care taking of selected trees and bushes species) in pilot plot are developed.
- Forages sustainable production techniques, using original and revegetated vegetation are developed

4 - Evaluation Findings

4.1. State of Rio Grande do Norte Multi-annual Plan.

IDEMA is working on the delimitation of differentiated small spots of the Caatinga ecosystem in order to improve its environment conservation actions using the project outputs also. The results will be a set of thematic maps disposable for download in PDF format in the government site.

The multi-annual plan of the state government (PPA – Plano Pluri Annual) allocates for the “Desertification Control Project” six million “reais” to develop actions of environment conservation and 2.3 million to environment education.

Seven others items in the Plan shows activities geared to income improvement and development of Caatinga areas. The Caatinga vegetation covers 80% of the territory. Therefore most of the planned development activities impact the Caatinga environment in some way, although this fact is not clearly stated, or, sometime not perceived. The PPA is on the site www.seplan.rn.gov.br

4.2 – Resources delivered to the project and work execution gap.

JICA provided financial resources in a total of 138,358,000 yens.

The gap between the availability of the financial resources and the execution of the research activities was due to the delay in delivering the equipment.

The equipment provide by JICA is listed in the next entry.

At the pilot plot was constructed:

- A simple lodge with area of 60 sq. meters;
- A seedling nursery besides the lodge;
- Barbwire fences dividing the experimental area in nine 1ha. lots; and
- A galvanized wire net fence around the meteorological station.

UFERSA provides all necessary facilities for the project. The office is in two connected 24 sq. meters rooms. The scientific equipments are installed in specific laboratories and at the meteorological station in Pedro Avelino.

In terms of resource people:

- JICA provided a long term expert from November, 2003 to October 2006 and nine short term experts.
- UFERSA provided two full time technicians since September, 2002, (but the activities started in November, 2003, only) fourteen part time technician or professor for specific activities and some internship.
- IDEMA provided two part time technicians since September, 2002 (but activities started in November, 2003, only).

4.3 Actual conditions of maintenance and operation rate of equipments, facilities and pilot plot.

Localization and Operation rate of Equipment

<i>Nº Ord</i>	<i>Quant</i>	<i>SPECIFICATION</i>	<i>LOCALIZATION</i>	<i>OPERATION RATE*</i>
01	01	Meteorological station**	Pilot Plot area	A
02	01	Irrigation system	Pilot Plot area	D
03	04	Soil temperature sensors system	Pilot Plot area	A
04	01	Soil moisture sensors system	Pilot Plot area	A
05	01	Portable photosynthesis analyzer	Project office	B
06	01	Poremeter	Project office	B
07	01	Portable salinity analyzer	Project office	C
08	01	Portable wind velocity sensor	Project office	C
09	01	Pressure chamber	Project office	B
10	01	GPS – Global Positioning System	Project office	B
11	01	Vehicle model Blazer diesel 4x4	Project office	A
12	01	Desk top computer	Project office	A
13	01	LCD projector (data show)	Project office	B
14	02	Notebook	Project office	A
15	01	Copy machine for vegetation analysis	Project office	A
16	01	FAX machine	Project office	A
17	01	A 3 color printer	Project office	B
18	01	Digital video camera	Project office	C
19	01	Digital photo camera	Project office	B
20	01	Scanner	Project office	C
21	02	Atomic absorption spectrum photometer	Soils and Geology Laboratory	A
22	01	Refrigerator	Soils and Geology Laboratory	A
23	01	Portable precision scale with interface	Animal Nutrition Laboratory	C
24	02	Analytic scale	Animal Nutrition Laboratory	B
25	01	Large oven with forced ventilation	Animal Nutrition Laboratory	B
26	01	pH meter	Animal Nutrition Laboratory	C
27	01	Calorimetric pump	Animal Nutrition Laboratory	B
28	01	Refrigerator	Animal Nutrition Laboratory	A
29	01	Reverse osmosis water purifier	Animal Nutrition Laboratory	B
30	01	Laboratory grinder	Animal Nutrition Laboratory	B

* A: Daily; B: Frequently; C: Occasionally; D: Seasonally

** Meteorological station equipments: 2 anemometers; 3 air temperature and humidity meters; 1 pluviometer; 1 radiometer; 1 soil thermometer; 1 photo-voltaic panel; 1 battery and 1 data logger.

All piece of equipment are in good conditions and need trained professionals to operate them. The initial training was done by the Japanese experts when each piece was installed. By the end of this evaluation all of them were installed and the operators trained.

The atomic absorption spectrum photometer is in intensive use in research activities and in conventional soils analyses.

The pilot plot in Pedro Avelino is visited by the long term Japanese experts and the Brazilians full time counterpart twice in the week. The short term Japanese experts and others Brazilians technicians and professors allocated to the project go there according to their activities needs. Two workers were trained and hired by the project to do the daily observations and data collection.

The meteorological station is equipped with a data transmission system, developed by an UFERSA technician, which allows collecting the data through e-mail.

The facilities of the project are in reasonable use conditions, although needing maintenance work of utilities (electricity, water supply, etc.) as everywhere in other facilities in UFERSA campus.

4.4 – Available Technical Reports.

1. Hayashida, Maki – Digestion test and mineral contents in goat blood. February, 2006. In Japanese.
2. Kishimoto, Tsukasa et alii – Technology development for revegetation and use of degraded areas in Semi-arid region in “Rio Grande do Norte” state. July, 2006. In Portuguese.
3. Nobuch, Tadashi – “Caatinga” useful trees species – Interview with local farmers. April, 2004. In Japanese, English and Portuguese.
4. Okumura, Takenobu – “Caatinga” region climate data. October, 2005. In Japanese.
5. Sato, Toshio – Extension of farm management techniques based on “Caatinga” project partial results. May, 2006. In English.
6. Sekine, Junjiro – Manual for digestion test in goats and chemical analysis in laboratory. February, 2004. In English.
7. Sekine, Junjiro – Actual conditions of farm management in “Caatinga” - interviews with farmers. April, 2004. In Japanese.
8. Sekine, Junjiro – Manual for digestion test in goats and chemical analysis in laboratory. June, 2004. In Japanese.
9. Tamai, Shigenobu – Suggestions for selection of pilot plot area, planting methods and cultivation. November, 2003. In English.
10. Tamai, Shigenobu – Seedling growth results during dry season of the year 2005 and seed germination test in “Caatinga” natural conditions. April, 2006. In Japanese.
11. Yabe, Katsuhiko – Pilot plots soils physical conditions in “Pedro Avelino”. August, 2004. In Japanese.
12. Yamanaka, Kazunori – Photosynthesis and water potential of some “Caatinga” species. July, 2005. In English.
13. Galvão, Ricardo et alii – Farm Management at “Fazenda Barra da Cruz” in “Angicos”. April, 2006. In Portuguese.
14. Araújo, José Erivaldo de; Kishimoto, Tsukasa – USEFUL Tree Species in Caatinga. Photographs and description. 2006. In Japanese, English and Portuguese.
15. Oliveira, Dagmar Alves de – Chemical Characterization of Soils Profile. 2004. in Portuguese.
16. Júnior, Antonio Francisco de Mendonça – Digestion Test in Sheep and Chemical Composition of “Maniçoba” (*Manihot maracassensis*) hay. In Portuguese.
17. Maia, Keila Moreira et alii – Digestion test in sheep and Chemical Composition of “Tifton 85” (*Cynodon spp.*) and of Industrial Leftover of Cashew (*Anacardium occidentale*, Linn) Pseudo-fruit. 2006. in Portuguese.
18. Kishimoto, Tsukasa et alii – Technology development for revegetation and utilization of degraded areas in Semi-arid region in “Rio Grande do Norte” state (Caatinga Project JICA-UFERSA-IDEMA) progress report 2005. in English
19. Yamamoto, Aya et alii – Light response curve of photosynthesis of important trees species in Caatinga vegetation, Northeastern Brazil. 2005. in Japanese with English summary.
20. Vegetation map of Rio Grande do Norte. 2006. Soil map of Rio Grande do Norte.
21. Vegetation map and Stand structure of Pilot Plot of Caatinga Project.

22. Soil permeability of Pilot Plot.
23. Grass Biomass of Pilot Plot.
24. Monthly Report of Meteorological data of Pilot Plot.

Anyone of those reports is edited. Some of them were sent to the UFERSA library. All are available in project office by the end of this evaluation.

4.5 – Brazilians personnel trained in Japan

Seven professionals were trained in Japan already. They grade this activity as very important. The way to set research sites, organization and personal compromise are listed among the important learning they got. The perception of different cultural approach to solve unexpected difficulties is cited as an input to improve their work behavior.

The Brazilian professionals became aware how useful is work together with foreigners expert to improve there knowledge and abilities to do research project.

4.6 – Extension Activities

In UFERSA they are done through student participation in labs, in the execution of digestibility test in animal, field works and in office activities. Students from State of Rio Grande do Norte University participate too. It is more like learning in service exercise.

Environment education was done in a Pedro Avelino elementary school in February and December, 2004 and in 2 high schools in Mossoro in 2006. The Pedro Avelino community is aware of the work and shows interest and curiosity about it. Mr Hildenei, the landowner of the farm where the pilot plot is located, is very enthusiastic with the attained outputs up to now.

In November, 2005 Mr. Kishimoto delivered a speech about the project activities at the International Symposium of Climatology, in Fortaleza, Ceara state, and in July, 2006 at the Brazilian Northeastern Botanical Society, in Mossoro.

They have been a kind of sporadic activities without a focus due to the effects of the project.

4.7 – UFERSA's and IDEMA's planning to finish the Project

Both institutions understand the need to keep the project going on in order to sustain what was done. The IDEMA counterpart informed that the institution will maintain the pilot plot workers in Pedro Avelino.

They are working to include the project in the institutional budget.

4.8 – UFERSA’s and IDEMA’s prospects to execute Projects of Research and Extension with International Cooperation

UFERSA is at a transition process from Mossoró Agricultural Superior School - ESAM –, an isolated school, to Federal Agricultural University for Semi-arid. The faculty is going from 70 to 105 members.

Professor Gustavo Pereira Duda, Director of Research and Professor Marcelo Pedrosa, Vice-rector of the Institution declared that “Caatinga” Project played an effective role on the confirmation of UFERSA’s expertise and ability for fund raising. Nevertheless that ability is not yet expressed in the formal structure of the Institution.

The hiring of new professors with PhD degree is a demonstration of UFERSA’s willingness to develop research.

IDEMA’s mandate is economic development and environment Controlling. It develops joint work with research institutions in order to improve its efficiency. Its organizational structure is flexible enough to do joint venture with extension and research institutions.

IDEMA may be very helpful to articulate UFERSA with others government and non-government institutions geared to “Caatinga” region development.

5. Achievements of Project

5.1 – General Consideration and Project Outputs

Objective of the Project was considered attained, because:

- Even though it is at very preliminary stage, counterparts of the Project are using knowledge acquired during the project to improve their research activities. To give some examples, development of portfolio of native forage plant (*forrageiras*) using animal digestibility technique obtained from Japanese experts, dissemination of meteorological data of the Meteorological Station equipped through the Project and publication of Monographs including instructions to University graduates, could be highlighted. Annual plans of research activities are being developed; in some items biannual plans are outlined.
- Booklets and manuals are gradually being elaborated after the termination of the Project, in prospect of diffusing Project results to researchers, extension workers and farmers.

The Project Design Matrix (PDM) (Annex I) specifies all the intermediate tasks to attain the results.

Output 1 - The general situation of utilization of vegetation and soils in the semi-arid region of RN is clarified.

The major accomplishments in regard to this result were the register of the knowledge developed by local farmers about the usefulness of the flora and the methodology to do it. The paper presenting the scientific name, the local name and the uses of 39 species of flora is a starting point to pursue the project purpose and for future research on technology improvement and basic science. Most of the new products we have today started with the identification of molecules component of plants used by traditional population.

The identification of species from hill land and low land is very useful information also. It will be very important to formulate farm technology model.

The map of use of soil was not done. That is not a big fault. The climate limitation in the semi-arid region does not allow much diversification of use even if some variation of soils characteristics occurs.

Output 2 - The general situation of domestic animal husbandry in the semi-arid region of Rio Grande do Norte state is clarified.

The report was done based on farmer interview. That is a good approach since it shows the farmer's perception of problems and their way to cope with it. This information may be the guidelines for extension materials preparation. It exposes the baseline for the project purpose

Output 3 – The natural characteristics, including vegetation and degradation, on the pilot plot and testimony plot are clarified.

The natural characteristics of the pilot plot were fully described. The materials produced may be reference for study of other semi-arid areas of Rio Grande do Norte State. There is

enough information to prepare a paper on something as a “Methodology for natural characteristics assessment of semi-arid areas – A case study”.

The meteorological data collected expose the climate constraints in the semi-arid region in study and enhance the understanding of the natural vegetation and the farmers’ management behavior. The combination of that historical series with the daily collection in the way now will permit actions with more precise timing to develop revegetation techniques.

The formulating of a handbook for researchers including manuals of soil moisture sensors operation and meteorological station data collection were completed.

The study was not done on the planned testimony plot because that place does not fit well in the semi-arid concept. The testimony plot issue must be revisited in the future.

Output 4 - Trees and bushes species from the pilot plot, potentially useful for local communities, are selected.

There was four species selected for use in community life, four species selected for use in domestic animal husbandry and one useful for both. This selection is a good example of use of the reports written to produce output 1, to produce appropriated technologies which are the essence of the project purpose.

Output 5 – Revegetation techniques (seedling production, planting and care taking of selected trees and bushes species) are developed in pilot plot.

The project team did everything could be done during the duration of the project. They developed knowledge about seed collection, seed storage, seedling production, planting and care taking of native species. The works must continue in order to have the technology tested.

Output 6 - Forages sustainable production techniques, using original and revegetated vegetation are developed in pilot plot.

The techniques to use the original vegetation raw material to feed animals were developed. To storage these materials as hay were developed also. All that information is ready to deliver to farmers.

The sustainable production techniques are incomplete. It implies to have more knowledge about:

- The carrying capacity of a plot of land;
- The sustainable production of raw material for hay;
- The techniques of revegetation.

The biggest accomplishment in regard to this result is the technique developed to improve the animal husbandry using native vegetation. That is a step toward sustainability already. But dissemination of techniques to use “Caatinga” land must be part of Federal and State Governments Plan.

5.2 – Implementation Process

The March, 2005 evaluation of the project does a precise assessment of the timing in the following way:

“Timing was inappropriate. Dispatch of a long-term expert of Floral Zoning and Ecology, the only long-term expert for the Project, was delayed by one year and two months due to procedural reasons, including issuing a visa: the expert arrived at the Project site only in November 2003, until when the Project activities had not commenced. In addition, the period from December-February is summer holidays of ESAM so that full-scaled activities could not start promptly.

Timing of provision of the equipment has not been very appropriate. The Project car and a GPS station had not arrived at the Project site until March 2004. Meteorological stations have not arrived yet so that observations of the meteorological conditions in the pilot plot and the observation plot (i.e. Activity 3-3) could not start. An atomic absorption spectral photometer, which is necessary for nutrition analysis already started (Activity 6-1) has not arrived either. In the meantime, an electronic balance and an air-forced dry oven have been provided in time for the relevant activity.”

The project conclusion was postponed to October, 2006 and the PDM and PO were adjusted to that new time horizon.

Some implementation problems happened still. The project team worked hard but some technical reports were been writing still now at the end of the project. The impact within UFERSA and IDEMA, at least, would be bigger if they had been done and published at the right time. The timetable match is the kind of activity administrative personnel could do. Another example of timetable match problem was the training of Brazilian technician to use some scientific equipment at the last month of the project.

The Joint Coordination Committee more frequent presence would have minimized that kind of problem.

6 – Project Evaluation by Five Criteria

The evaluation in accordance to the five criteria established in the Terms of Reference is presented below.

6.1 – Relevance

The Overall Goal and the project purpose are relevant with overall ODA policies of Japan. According to the “Official Development Assistance Charter” prepared by the Government of Japan, “addressing global issues” is one of the four priority issues. They are also relevant with Japanese ODA policies for Brazil. According to ODA country policy towards Brazil, environment is one of priority area. Development of the northern and northeastern parts of Brazil is also important theme of Japanese assistance in Brazil.

The Superior objective may be considered as a proposed tool of public policy for the development of Northeastern Brazil. Its relevance should be evaluated in such context. Desertification of the northeastern part of the country is listed as one of the environmental problems with global-scale. As such it is considered to deserve international assistance.

The project looks for solution to “Caatinga” desertification problem and poverty mitigation in the “Caatinga” ecosystem communities. Since “Caatinga” vegetation covers 80% of the territory and is the habitat of 40% of “Rio Grande do Norte” State population, its political relevance is overwhelming

At the level of the institutions involved the project activities were very important also. In the process to transform “Mossoro Agricultural Superior School” (ESAM) into University (UFERSA) it was presented as an example of the institutional ability to do scientific and technological research. IDEMA considers that they have now a technique to enhance environment conservation in more acceptable way to rural communities.

6.2 – Effectiveness

The project’s outputs confirmed its effectiveness. After everything been considered (the time length of the activities, the work conditions, the timing and operational issues) it is possible to say the objectives were attained although work is in progress to finish two results. The continuity of the research efforts is necessary.

The March, 2005 adjustment was not enough to guarantee the attainment of all six results expected. The development of revegetation techniques in “Caatinga” requires a period of time greater than the project duration. The solution to this issue is to maintain the research work at the pilot plot for more seven to nine years as UFERSA/IDEMA activities with or without International Technical Cooperation.

The climate data shown in Takenobu Okumura August, 2005 report hints a rainfall cycle around twelve years. This would be the time span for development of revegetation technique in “Caatinga” natural conditions. The retrieve of research works done from the years 1997 to 2000 in the municipality of “Equador” may be helpful since over there the ecosystem is

similar. “The State of Rio Grande do Norte Profile”, edition 2002, says at page 22 “Studies done in 1998 identified areas in desertification process in the municipalities of “Equador”, “Parelhas”, “Carnaúba do Dantas”, São José do Seridó”, and “Caicó” belonging to “Caicó” and “Currais Novos” zone.

6.3 - Efficiency

The project financial resources were used in very frugal way. Everything in the office and in the pilot plot was kept at the necessary quantitative and qualitative level.

In regard to human resources some problem occurred. A trained professional to do administrative service, translation and controlling was absent. The solution was to hire some part time student, with the Japanese money, and to have the full time technicians working extra time to do research and administrative tasks. Such misallocation of competence could have jeopardized the efficiency in the use of resources. Luckily, everything ended up fine.

6.4 – Impact

The impact toward the overall and the project objectives can not be fully evaluated yet because the attainment of two results is in progress yet. In spite of that the project produced a clear impact in UFERSA and IDEMA and build up a new approach to cop with desertification and good expectations for the future.

In UFERSA the project push on the prestige researchers. Furthermore it made clear the possibility to do research with what you have in hand. The professors and technicians that worked in the project learn to improve their creativity and to qualify themselves as researchers.

In IDEMA was consolidated the idea that sustainable development and environment conservation depend upon research and extension. Two professionals in level of decision making process made clear that the institutions will invest in partnership for research and extension as a support for environment controlling and environment law enforcement.

The impact on all “Caatinga” environment had been bigger if more publicizing efforts had done.

6.5 – Sustainability

As mentioned in Relevance, control of desertification is a national commitment of Brazil. Revegetation techniques development and desertification control are in the work plan of, Brazilian Agricultural Research Corporation - EMBRAPA, Universities and some multi-lateral institutions like International Institute for Agricultural Cooperation - IICA, United Nations Development Program - UNDP and United Nations Environment Program -UNEP. The Multi Annual Plan of “Rio Grande do Norte” State Government puts desertification control and reduction of poverty among its priorities. The policy support for the activities relevant to the Project is likely to continue.

The question to be addressed now is how to implement the policies. The scientific information about the endangered areas is not available completely yet and, due to the need to

overcome the problem it is not unusual to see trial and error approach to technology development.

Among other approaches present in the region there is one that bring supplies for the local communities in the assumption then they will not forage the natural environment. In this case they talk about techniques of environment preservation instead of environment conservation.

Both cases imply a change of mind set. Education and extension activities are necessary tools for that purpose. The way the change goes will define the level of sustainability. The institutions present in the area should interact in order to establish a trend and a time horizon adequate to the biophysical and social component of the environment.

What is desperately needed is a strategy to make that integration of efforts. It is difficult to say which approach, or, which combination of them will be the solution. The research and development process inaugurated by the project may be sustainable if and only if a strategic plan of technology transfer is in place. The project must be publicized among universities, research and extension institutions and others related to sustainable development at least.

It seems to be a consensus that in “Caatinga” region the biggest environmental stress comes from the struggle to provide basic supplies for the inhabitants. The approach of the project is to developed techniques that make environment conservation a valuable asset for the survival and income improvement of local communities. Therefore the methodology developed has considerable probability to spread to other institutions.

The counterpart personnel are public employees whose employment is guaranteed. They are motivated to engage in research on revegetation and fodder production. They got the basic skill and researcher’s manuals for some of the methods had been prepared already. However, they need more training and expert guidance. It seems that they will remain involved in the activities inaugurated by the Project, in spite of both institutions – UFERSA and IDEMA – do not have a specific research plan for regeneration of degraded areas.

UFERSA and IDEMA had managed the Project adequately. The counterpart personnel have operated and maintained the project equipment properly and is expected to utilize them in the relevant research after the termination of the JICA cooperation. Financial situation of UFERSA is severe. To continue the research activities UFERSA have to coordinate with IDEMA to access funding agencies and build up institutional partnership with institutions like EMBRAPA, National Institute for Semi-arid – INSA, Agricultural Research Corporation of Rio Grande do Norte State - EMPARN and Technical Assistance and Rural Extension Corporation of Rio Grande do Norte State -EMATER.

7. Conclusions and Recommendations

7.1 - Conclusions

1. The “Caatinga” project did not attain all results at the end of project (some manuals were edited after end of project) but realized what was feasible within the project design span. The attained results and the research and technology development process established in UFERSA justified the resources invested.
2. The project had a positive influence on people that take decision about science, technology and sustainable development in UFERSA and IDEMA. At UFERSA campus a 5 ha plot of native trees and bushes useful for animal feeding is being implemented. IDEMA is planning to use the manual produced by the project in its activities everywhere in State of “Rio Grande do Norte”.
3. The Japanese experts’ presence in UFERSA brought a different approach to scientific research that helped professors and technicians. The in service solution for unexpected problems and the compromise with the scientific rigor were more effective to behavior change than formal training.
4. The Brazilians research visit to Japanese research center increases their credibility within UFERSA and hustle them to more compromise. The four week training highlighted in them the scientific criteria and spur their ability to auto learning. It built up expectation for better results and more responsibility within the home institution.
5. All the field work was done in Pedro Avelino only. The land adjacent to the pilot plot satisfied the conditions of control area. The EMPARN plot became unnecessary besides being not representative of “Caatinga” ecosystem.
6. The project outputs were attained, and the technical reports are ready for edition.

7.2 - Recommendations

1. UFERSA and IDEMA decided to continue the project. UFERSA should put the project in its budget. Strategy to amplify he partnership including EMPARN, EMATER, EMBRAPA, at least, is a need. JICA partnership methodology may be used as an example to build that framework.
2. It is recommendable a statistic treatment of the climate information to confirm, deny or adjust the 12 years cycle hypothesis I did. It was formulated based on the analysis of the data presented in Takenobu Okumura’s report. It would be interesting to make the report available in UFERSA’s site to promote a peers discussion.
3. For further detail study of output 5 - Techniques for sustainable forage production in areas of original and revegetated vegetation – the recommendable foci may be:

- To prepare extension materials together with extensionist (UFERSA & IDEMA);
 - Fine tuning of original vegetation harvest techniques to species development variability during the year (UFERSA);
 - To make the measurement of vegetation gross product in different periods of the year (UFERSA);
 - To test how many harvest of original vegetation mass production per year is economically viable UFERSA);
 - To develop cultivation technique of the most productive original species UFERSA);
 - To develop a technological model of small farm suitable for the region (UFERSA).
4. For further detail study of output 6 – Revegetation technique – the recommendable foci may be:
- Repetition of seed harvest and storage technique (UFERSA);
 - Repetition of germination test with different treatments (UFERSA);
 - Repetition of planting techniques with weekly interval during two months (UFERSA);
 - Repetition of the rate of survival analysis (UFERSA);
 - Observation of seed germination in natural conditions in the undisturbed plots (UFERSA);
 - Observation of the survival conditions in the undisturbed plots (UFERSA).
5. To produce extension material should be interesting to have a expert in the field. The team members are not prepared for that purpose. They are able to transfer information to extensionist but not to do extension activities.
6. The area worked in the municipality of “Equador” during the 1997 to 2000 project may be useful to advance the harvest activities in revegetated condition. IDEMA counterpart informed that it is fenced still and suitable for that purpose.
7. The superior administration of UFERSA should take the Project Expansion Document to Brazilian Federal Agencies and RN State Agencies in search of partnership and financial support.

7.3- Lessons Learned

6. Comprehensive information review is essential to project formulation in order to design objectives and results feasible. During the project formulation would be useful a review of the work done in the municipality of “Equador” or even a visit to that plot. It seems that a review of the related literature was not well done. The RADAM project would have improved the identification of cartographic products needed.
7. Process management and careful Controlling by the administrative personnel are as important as the hard work of the scientific team.

8. Administrative personnel are as necessary as researchers. Management and Controlling should be close to technical and scientific activities. A joint meeting each three months could be a good start.
9. Timetable compliance is crucial to projects related to biophysical conditions. One to two months delay could mean a year delay.
10. Publication of technical information and partial result along the project execution should be encouraged.
11. A project should have a publicizing component in order to foster interaction and complementary actions among related institutions.
12. Any technology development related to natural ecosystem is constrained by the ecosystem determinants. In “Caatinga” the apparent average 12 years rain cycle oscillation would be time horizon for revegetation techniques in natural conditions. After that time the information about the rate of survival of tested species will be consistent to allow evaluation of project effectiveness. A document expanding the duration and activities of the project to that length could be written.
13. The Joint Coordination Committee more presence may give a better status to a project increasing the opportunities for divulgation of results. This is a crucial issue to fulfill any project objectives. The results should be known by the people empowered to formulate public policies. The trilateral meeting of Brazilian International Cooperation Agency of Ministry of External Relations- ABC/MRE, JICA and the Executing National Institutions could help to do that job also.

7.4 –Follow-up Situation

N/A.

(UFERSA is decided to maintain the project activities. It allocates some of the new hired Professors to do research with the project team. They are enthusiastic with the methodology and with the results accomplished up to now. But almost all Brazilian Federal Universities have budget constrains to investments and equipment maintenance. So the intensity of actions depends on the kind of partnership established.)

IDEMA’s counterparts are interested to continue the partnership also. They need to be successful in selling the project to the new State Government. Both technicians involved in the project have some leverage to do that. The 2007 institutional budget has enough room from where they may draw support.

The enlargement of the partnership has good probability. EMBRAPA and some others Federal Agencies (Ministry of National Integration; Ministry of Environment; Ministry of Sciences and Technology; Ministry of Agrarian Development) contemplate desertification control in the 2007 budget.

ANNEX I - PDM - November, 2002 to October, 2006.

NARRATIVE SUMMARY	OBJECTIVE INDICATORS	VERIFICATION MEANS	IMPORTANT ASSUMPTIONS
<p>Superior Objective</p> <p>Technologies to utilize the productive potential of the Semi-arid region vegetation and soil are disseminated in Northeast Brazil (Caatinga region).</p>	<ol style="list-style-type: none"> 1. Reduction of desertification process in "Caatinga". 2. Increase of animal production 	<ul style="list-style-type: none"> - Observation in "Caatinga". - Rural sector statistical data from the state government. 	
<p>General Objective</p> <p>Appropriated technologies for degraded areas regeneration, utilizing useful trees and bushes species, are disseminated in Semi-arid region of Rio Grande do Norte State (RN)</p>	<ol style="list-style-type: none"> 1. Reduction of desertification process in "Caatinga". 2. Increase of animal production. 	<ul style="list-style-type: none"> - Observation in RGN. - Rural sector statistical data from the state government. 	<ul style="list-style-type: none"> - The climate will not change drastically, like severe drought.
<p>Project Objectives</p> <p>Appropriated technologies for degraded areas regeneration, utilizing useful trees and bushes species, are disposable in Semi-arid region of Rio Grande do Norte State (RN)</p>	<ol style="list-style-type: none"> 1. C/P from ESAM are trained to do research anywhere in RN using technology transferred by the Project: a) C/P technical level; b) speeches delivered by C/P; c) a general research; d) research proposal submitted to financing agencies; e) specifics reports, etc. 2. Leaflets for local populations prepared in the Project are adopted by IDEMA and correlated institutions. 	<ul style="list-style-type: none"> - Questionnaire; interview with Japanese experts and counterparts. -Document analysis. 	<ul style="list-style-type: none"> - The climate will not change drastically, like severe drought.
<p>Outputs</p> <ol style="list-style-type: none"> 1. The general situation of utilization of vegetation and soils in the semi-arid region of RN is clarified. 2. The general situation of domestic animal raising in the semi-arid region of RN is clarified. 3. The natural characteristics, including vegetation and degradation, on the pilot plot and testimony plot are clarified. 4. Trees and bushes species from the pilot plot, 	<ol style="list-style-type: none"> 1a: A technical report on general utilization of soils and vegetation from the semi-arid region of RN containing: 1) a map of the use of soil and a analytical report; 2) a map of vegetation; and 3) a list of useful trees and bushes species. 2a: A report on domestic animal raising in RN State prepared. 3a: Maps of soil and vegetation from the pilot plot prepared. 3b: Meteorological data collected daily. 3c: Handbook for researcher prepared. 4a: Trees and bushes species utilized by local population 	<ol style="list-style-type: none"> 1-5 - Questionnaires; interview with Japanese experts and counterpart. - Analyzes of documents. - Analyzes of the following documents: <ol style="list-style-type: none"> 1. Technical report. 2. A technical report. 3. Maps of the pilot plots and handbooks. 4. Catalogues and handbooks. 	<ul style="list-style-type: none"> - Counterparts stay in ESAM and IDEMA.

NARRATIVE SUMMARY	OBJECTIVE INDICATORS	VERIFICATION MEANS	IMPORTANT ASSUMPTIONS
potentially useful for local communities, are selected.	<p>were identified.</p> <p>4b: Trees and bushes species from pilot plot, potentially useful to additional research plot were identified.</p> <p>4c: A catalogue of trees and bushes species of RN were prepared for researchers (i.e. species identified in 4a).</p>	<p>5. Handbooks and technical report.</p> <p>6. Handbooks and technical report.</p>	
5. Revegetation techniques (seedling production, planting and care taking of selected trees and bushes species) are developed in pilot plot.	<p>5a: Trees and bushes species from area adjacent to pilot plot, appropriated for revegetation were recommended.</p> <p>5b: Revegetation handbook for researchers was elaborated.</p> <p>5c: A technical report on revegetation system containing even information on carrying capacity was prepared.</p> <p>5d: Leaflet on revegetation method was prepared for local population.</p>		
6. Forages sustainable production techniques, using original and revegetated vegetation are developed in pilot plot.	<p>6a: Forage species from area adjacent of pilot plot, appropriated to domestic animal raising were recommended.</p> <p>6b: Manual on sustainable forage production to raise domestic animals was prepared for researchers.</p> <p>6c: A technical report on sustainable forage production was prepared.</p>		

Activities	Investments	Preconditions:
<p>1-1 To analyze the actual use of soil using satellite imagery owned by RN State Government.</p> <p>1-2 To research the vegetation from RN State Semi-arid region.</p> <p>1-3 To identify the soil utilization in RN State Semi-arid region.</p> <p>1-4 To research the trees and bushes utilization in RN State Semi-arid region.</p> <p>1-5 To prepare a report on land and vegetation utilization in RN State Semi-arid region.</p> <p>2-1 To identify the domestic animal raising system – land area, types, number and animal uses – in RN State Semi-arid region.</p> <p>3-1 To select a pilot plot in degraded area.</p> <p>3-2 To prepare maps of soils and vegetation from pilot plot and testimony plot (in EMPARN experimental station in dry land).</p> <p>3-3 Meteorological data collected daily in pilot plot and in testimony plot.</p> <p>3-4 To prepare manuals for researchers.</p> <p>4-1 To identify the trees and bushes from pilot plot To select trees and bushes species from pilot plot, potentially useful for animal raising necessary for community survival and for domestic animal raising.</p> <p>4-2 To select trees and bushes species from pilot plot, potentially useful for community life.</p> <p>4-3 To select trees and bushes species from pilot plot, potentially useful for animal raising.</p> <p>4-4 To prepare a catalogue of species identified in 4.1 for researchers.</p> <p>4-5 To prepare a leaflet on species identified in 4.1, for local population.</p> <p>5-1 To calculate the pilot plot plants biomass and productivity to raise domestic animals.</p> <p>5-2 To research domestic animal feeding behavior on the pilot plot.</p> <p>5-3 To calculate carrying capacity of the pilot plot.</p> <p>5-4 To propose germination techniques of the selected species.</p> <p>5-5 To propose seedling production technique of the selected species.</p> <p>5-6 To identify planting techniques of the selected species.</p> <p>5-7 To test the identified planting technique on the pilot plot.</p> <p>5-8 To prepare manuals of technique developed by the Project, for researchers.</p> <p>5-9 To prepare a technical report on RN State Semi-arid areas revegetation system containing even information on carrying capacity.</p>	<p>Japanese Government:</p> <ol style="list-style-type: none"> 1. To supply experts. 2. To train Brazilian counterpart in Japan. 3. To supply equipments. 4. Current expenditure. <p>Brazilian Government:</p> <ol style="list-style-type: none"> 1. To supply land, buildings and other facilities to the Project. 2. To allocate counterpart and administrative personnel. 3. Current expenditure. 	

<p>5-10 To prepare a leaflet on revegetation methods for local population.</p> <p>6-1 To identify sustainable forage production techniques based upon the pilot plot carrying capacity to raise domestic animals.</p> <p>6-2 To test the Project identified techniques on the pilot plot.</p> <p>6-3 To prepare manuals of technique developed by the Project, for researchers.</p> <p>6-4 To prepare a technical report on sustainable forage productions.</p>		
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