Environmental Education – Note prepared by Jan van Wonderen 24 November 2004

1 Introduction

This note presents in abbreviated format some of the ideas that I have regarding environmental education. These ideas were noted during my last visit to Brazil in March 2005 and are now available to the team members for discussion.

Our involvement in the environmental education initiative, which is taking place in Pesqueira and Jatauba municipalities, should have emphasis of those aspects of environmental education that are relevant to the KaR project. Thus they should relate mainly to water and land in their interlinked context.

It is anticipated that this note will serve as a guideline for the training of teachers and it is not sure yet whether it is too comprehensive for use in the curriculum. This will need to be decided in due time. The aim should be to present the technical issues in a 'language' that is easily understood by the teachers who are going to be responsible for teaching environmental topics to school children and adult community members.

I see this 'translation' of what are complex concepts a task for Iran, under supervision of the technical and social development team members, and with participation of the school teachers.

In relation to participation in teaching activities, which includes the introduction of practical work related to monitoring, these should be restricted to schools and adult teaching classes in our project areas.

2 Water Resources and the Environment

2.1 The Hydrological Cycle

The following could be considered in relation to the hydrological cycle:

(a) The hydrological cycle, which in essence tells the journey of a raindrop (could involve graphics material).

(b) Influence of the environment on the hydrological cycle:

- Deforestation and vegetation clearance, which could result in:
  - Reduced water retention
  - Increased surface runoff
  - Soil erosion
  - Damaging floods
  - A larger proportion of water is lost
- Use of pesticides, which could result in:
  - Pollution of water

- Often an invisible threat
- Health problems

(c) The influence of water on the environment

- Degradation of soils due to irrigation:
  - Use of pesticides
  - Danger of salinisation
  - Threat to health when polluted groundwater is used for drinking
- Vegetation may rely on a shallow groundwater table and may therefore be affected by groundwater withdrawal for irrigation. This results in dilemmas and compromise.

2.2 Competing Use of Water

(a) Type of use

- Human consumption for drinking
- Domestic consumption for household use
- Animal consumption
- Industrial use
- Agriculture/irrigation
- In terms of quantity, use of groundwater for irrigation is much larger than the sum of other uses
- In terms of quality, there are different constraints on the acceptability of groundwater for different purposes. This in relation to human/animal health, suitability for industrial purposes (which could also be a health issue if water is used for food processing) and tolerance of crops/vegetation to water quality (particularly salinity).

(b) Priority of use

- Human consumption has highest priority
- Thus when water is short, cutbacks need first be made other usage.

(c) Water use in relation to water quality

- For human consumption there are differences in use for drinking, cooking, cleaning, and washing. This impacts on where water comes from.
- Water quality is affected by pollution and this takes a variety of forms. It includes salinity, pollution by toxic chemicals such as pesticide, and bacterial/viral pollution. The different types of pollution have different implications on human, animal health and the health of crops and natural vegetation.

2.3 Water Resources

(d) Groundwater

- What is groundwater?
- Where does it come from?
- How does it move?

- Where does it go to?
- How is it used?
- How is it taken out of the ground?
- What is it used for?
- What are the threats to its availability? (overuse, drought, etc)
- What are the threats to its quality? (pesticides, faecal pollution, salinisation)
- What degree of recycling takes place? (household waste water, retrun of excess irrigation water)

(e) Surface water

- What is surface water?
- Where does it come from?
- How does it move?
- Where does it go to?
- How is it used?
- How is it taken out of the ground?
- What is it used for?
- What are the threats to its availability? (overuse, drought, etc)
- What are the threats to its quality? (pesticides, faecal pollution, salinisation)
- What degree of recycling takes place? (household waste water, return of excess irrigation water)

(f) Linkage between surface water and groundwater

(g) Groundwater resource limitations

- Groundwater is a limited resource when there is insufficient rainfall or when too much is extracted from the underground reservoir.
- If more water is extracted from the groundwater reservoir than what comes in from rainfall or river bed infiltration, the groundwater table drops and the reservoir will empty so that water is no longer available.
- When keeping using too much groundwater the groundwater reservoir becomes empty and/or the water quality will become very poor.

(h) Surface water resource limitations

- The limitations are similar to those for groundwater, although the deterioration in water quality may become a lesser issue.

(i) Groundwater and surface water management

- The key is knowing how much you have and how much is left when you used it for different type of consumption
- If it does not rain or there is insufficient rainfall (during a drought), for how long will it last? This depends on how much is being used for different purposes.
- To manage the resource in a sustainable manner requires knowledge of the resource and an understanding of the water balance.

- The water balance is the balance of inflows and outflows to and from the reservoir and if these two are not equal a change in reservoir storage will occur.
- Inflows to a groundwater reservoir include rainfall infiltration, infiltration of river water through the river bed, re-infiltration of used water and groundwater inflow towards the river valleys from upland areas located outside the alluvial valleys of the river.
- Outflows from a groundwater reservoir include outflow into rivers where it becomes surface water, and extraction by men (for irrigation and other uses) and natural vegetation (roots extracting water from a shallow groundwater table).
- Inflows to a surface water reservoir include inflow from rivers, overland flow and direct rainfall, while outflows include losses through the bed and sides of the reservoir (to groundwater or surface water), evaporation from the water surface and abstraction or release (such as is the case for Pão d'Açucar reservoir).

(j) Keys to effective and sustainable management of water resources

- Knowledge of the resource
  - How much do I have?
  - Where does replenishment come from?
  - How is the water resource replenished and by how much?
  - How much am I using and for what purpose?
- Monitoring of:
  - Rainfall
  - Evaporation
  - Groundwater levels
  - Groundwater quality
  - Areas irrigated
  - Types of crops that are irrigated
  - Quantity of irrigation water used
  - Amounts of water used for non-agricultural purposes
- Organisation and collaborative/collective decision making:
  - How much water should I use?
  - How does water use depend on climatic circumstances?
  - What are the key indicators that determine actions related to water use?
  - Who owns the water?
  - Collective decisions on how much water can be used during water shortages (droughts) taking consideration of priority of water use (potable over irrigation).

2.4 Soil and Land Management

(a) Keys to effective and sustainable management of water resources

- Reduced runoff
- Less risk of soil erosion

- More soil moisture available for rainfed agriculture
- More contribution of groundwater to the alluvial valley groundwater reservoir

(b) Enhances the environment

(c) Improvement of land

- Re-vegetation
- Terracing or other ways of retaining water and reducing surface runoff
- Small retention structures in small streams would achieve retention

3 Practical Aspects

(a) Monitoring

- Pupils involved with installation of monitoring facilities such as rain gauges
- Preparation/construction of monitoring devices, such as for example measuring tape or a marked stick to measure groundwater levels in wells
- How to measure water use, considering direct and indirect methods
- Pupils involved in monitoring and data collation and this could feed into other subject matters, such as:
  - Mathematics
  - Geography
  - Science

(b) Land management/conservation/replanting, which could involve pilot schemes where work is carried out, visits to the area under guidance by local people with relevant knowledge (eg Seu Djalma and Seu Antonio)

(c) The three day teacher initiation should focus on our project areas and teachers can disseminate to other schools outside our areas.

Report on the Activities of the Environmental Education Programme

This document consists of the activities which comprise the Environmental Education Programme:

1. The Training of the Teachers on Environmental Education
2. Follow up and Monitoring Activities

It is important to mention that these activities were supported by the Secretariat of Education of the Municipalities of Pesqueira, Jataúba and the State of Pernambuco through the participation of the Xukuru Indigenous Group.

1. Training of the Teachers on Environmental Education - 23, 24, 25 May 2005

Agenda

23 May 2005 (Monday) – Day 1

Morning
Registration of the Participants
Opening
Adélia Branco – Social Development (SD) Team Member
Abelardo Montenegro – Technical (TE) Team Member
Cleide Oliveira – Secretary of Education of Pesqueira Municipality
Presentation of the TE Work
Abelardo Montenegro and Suzana Montenegro
Presentation of the SD Work
Adélia Branco, Maria da Paz Macedo and Iran Neves Ordônio

Afternoon
Presentation on Zero Base Programme
José Artur Padilha
Coffee Break

24 May 2005 (Tuesday) – Day 2

Morning
Field Visit to Monitoring Station in Rosário

Afternoon

Work in group by the teachers about the implementation of the Environmental Education Programme at the school level. Four groups were formed. Each group worked on one of the following themes:

1. Sources of Water and the Environment
2. Water and Contamination
3. Competing Uses of Water
4. The Elaboration of Monitoring Equipment

25 May 2005 (Wednesday) – Day 3

Morning
Group Presentations followed by a discussion by Project Team Members

Afternoon Session
Evaluation

Presentation of a Theatre Performance
Coffee Break
Closing

The sessions which took place in the first day of the training counted with the participation of around 70 individuals. There were 47 teachers from the schools located in the pilot areas in Pesqueira and Jataúba and from other rural schools found in Pesqueira. The remaining of the participants were representatives of Farmers Associations in the municipality of Pesqueira as well as representatives of the municipal government.

After the opening remarks, there was a presentation by TE team members about the technical aspects of the Project and about their importance to the Environmental Education Programme. The presentation was very objective and the technical aspects were presented in simple language so that the teachers could understand. The TE team members highlighted the importance of the Programme for rural students as a way of calling attention to the importance of agriculture and water to their daily lives. They talked about the importance of monitoring activities and its application to the agricultural production. They stated that the monitoring allows the farmers to know the amount of water that is being overused in irrigation and avoids the waste of water. There was a high participation by the teachers who asked many questions about the applicability of that knowledge to their teaching.

The presentation of the SD team members focussed on the important role teachers can play in changing reality and on the long-term implications of education. It stated that it was through the educational process that the actions of the Project could achieve sustainability. Therefore, the Environmental Education Programme was of great importance in the context of the Project. Following that, there was a discussion about the important contribution the farmers were going to give by participating in the teaching activity with the teachers. This could be seen not only as a way of empowerment for them, but was a way to show the students the importance of local traditional knowledge. There was an emphasis on the importance of the exchange of knowledge between the teachers and the farmers and on the importance of the practical experience to be gained by the students through the monitoring activities. The SD team members also called the attention for the type of monitoring equipment to be used at school, i.e. those developed by Prof. Ronaldo Freire of UFRPE at a very low cost. There was a discussion on the importance of the participation of the rural teachers in all of the stages of the implementation of the Programme and the important role they were expected to play in reading and testing the material to be used. There was also the presentation of ideas about themes to be dealt with in each of the disciplines: Sciences, Geography, History, Arts, Portuguese and Mathematics. It was also stressed the importance of an interdisciplinary approach in the context of Environmental Education. The teachers participated through the presentation of ideas and questions.

In the afternoon, there was a presentation by José Artur Padilha about the Zero Base Programme, which consists primarily of the use of rocks to retain water. The presentation was very interesting as he utilised many examples and complemented the presentations delivered in the morning by providing his views about the importance of Environmental Education.

The second day of the training consisted of a field visit to the monitoring station found in Rosário. Besides the teachers and the Project team members, there were two farmers from Rosário, Seu Geraldo and Seu Zé Clemente. Their participation was very relevant as they presented the practical view about the monitoring equipment. The visit was very productive as the teachers could see the monitoring equipment which had been discussed the day before and could actually see how they functioned and

understand their use. There were many questions by the teachers as they said they needed to understand well so that they could help their students understand.

Before the teachers initiated their work in groups in the afternoon, there was a discussion about the field visit which took place in the morning and their evaluation was very positive. The teachers were then divided in four groups and each group focussed on a different theme. The themes were:

1. Sources of Water and the Environment
2. Water and Contamination
3. Competing Uses of Water
4. The Elaboration of Monitoring Equipment

They worked in groups during the whole afternoon under the supervision of the SD team members.

The morning of the last day of the training was devoted to the presentation of the work done by the sub-groups the day before. Each group presented the ways through which they were going to deal with each of the four themes in their classrooms. The presentations were excellent and the teachers showed to have a great deal of initiative and to be very creative. The group which focussed on the elaboration of monitoring equipment delivered a very interesting presentation and shared with the others what they learned. This was very important as all of the teachers ended up learning about the elaboration of equipment and will be able to teach about them.

The overall evaluation of the training session was very positive. The participants, however, asked to have follow-up sessions to help them implement the Programme.

After that, there was a theatre performance by the students of one of the rural schools and Adélia Branco delivered the closing remarks.

2. Follow up and Monitoring Activities

After the initial training which set the basis for the implementation of the Environmental Education Programme, there were two more sessions in which the material being prepared for the teachers and the students was discussed. The opportunity was also for the teachers to bring the problems they were facing at their schools in regards to the teaching of the material. The farmers who were participating as lecturers also attended the sessions.

On 17 August 2005, there was a meeting which counted with the participation of all of the teachers, the secretaries of Education of Pesqueira and Jataúba as well as the representative of the Xukuru Indigenous Group. At the occasion, each of the teachers received their certificates and the written material for them to use as a guide to prepare the lectures. The Project team members also distributed illustration materials to be utilised at each of the schools.

In September and October, the SD team members visited each of the schools in order to monitor the teaching and to discuss with teachers and farmers the implementation of the Environmental Education Programme. This was an important stage of the Programme as the teachers had the opportunity to receive support to their activities, discuss the problems they were having and share the successes as well as lessons learned. This phase was a very relevant step towards the sustainability of the action. The teachers and farmers had the opportunity to share about their work at the Project Final Evaluation Seminar, which was held on 17 and 18 November 2005. At that occasion, the material published to be used by the students was launched by the Project Manager Jan van Wonderen.