

ACIAR Trip Report

Traveller:	P. C. Wall
Trip dates:	Mar 25-April 4, 2013
Countries visited:	Morocco, Algeria and Tunisia
Program:	CSE-2011-025

1. **Trip purpose.** Participate in the CANA project annual traveling workshop to observe the field studies.

2. Summary

A few days were spent in each project country with the objective of seeing all the field work this season to aid in the planning of next season's work. Unfortunately in none of the three countries did we observe all of the field work – future traveling workshops should not only focus on the project activities, but should probably allocate three days to field visits in each country to be able to complete the objective. This season has been wetter than normal and this probably has affected the relative importance of different factors limiting system productivity. This season weed control and fertilization (principally nitrogen) appear the two major limiting factors. In most sites plant stand with the existing seeders was adequate, although plant stand problems of both cereals and legumes were common in the wettest site – the Fernana Valley of Tunisia. The following general recommendations are made :

1. Generally the farm sites are too spread out. One of the objectives of concentrating the work is so that farmers can support each other and regularly and easily visit each other's' fields to learn from each other's successes, failures and experiences.
2. The idea behind the 10 farmer field sites this year was that these were to be sites for researcher-managed trials. The focus should be on learning, and therefore should include as many comparisons as possible, rather than applying blanket treatments at each site.
3. Weeds and nitrogen appeared to be the two biggest problems overall, although this season is wetter than normal. However, priorities need to be analysed and the project work plan adjusted accordingly. On the mechanization side it would appear that weed control equipment should also be prioritized.
4. If possible foliar samples should be taken from all sites for site characterization purposes. I suggest that 20-30 random wheat flag leaves be taken from each site at approximately the time of ear emergence, and analysed for P, K, Ca, Mg, S and micronutrients.

3. Project reporting

Morocco.

I arrived in Casablanca on the evening of March 25, a day later than intended after unfortunately missing a flight in London the previous day. Allan Mayfield and Barry Mudge representing Rural Solutions, and Ali Nefzaoui, the interim project coordinator, completed the first day of the tour, including the visit to the INRA Headquarters in Rabat, and to the Regional Research Centre at Settat.

On March 26th we visited three of the CANA project sites around Oued Zem, about 120km SE of Casablanca, followed by lunch and an excellent meeting with farmers and research and extension staff in the new extension building. Rainfall is higher than normal this season and so far there has been 414mm (average 300-350mm).

The following is a summary of the field work being conducted under Objective 2 in CANA in the Oued Zem area. The Moroccan team has made some fairly major modifications to the work plan based on their objectives in the region. They had evidently decided to start work in the CANA project in this area where they had not worked on CA previously so that errors in trying to develop and disseminate CA systems in the past would not affect the CANA project outcome. However, the CANA project also fits within the Settata research strategy which includes other projects focusing on CA, notably the EU-funded ACLIMAS project they have with the University of Lleida in Spain. The team, we were told, took the decision this season “to go for the optimum to show the farmer that NT is possible”, rather than following closely the work plan.

The eleven farm sites are spread over two communities (BeniKhirane and Smaala) with approximately 10 km between the two most distant project farmers. There are 11 farm sites this season, each with 4ha under no-till split with 2 ha of cereal and 2 ha of forage crop. The forage plot has been split into two, part with glyphosate herbicide applied prior to seeding, and part without glyphosate. As would be expected the plots without initial glyphosate have severe weed problems, a good demonstration of the need for initial weed control – **if** farmers are interested in clean forage crops.

The pea/barley forage crop at the first site was dominated by peas, with very few barley plants. This was discussed at some length, as evidently all of the forage crops in Oued Zem are similar, but plots sown with the same seed at the Settata station and at Ouled Zaid, the ACLIMAS site visited on the second day, are dominated by barley with very few pea plants surviving. One hypothesis stated is that the barley used this year, Hispanic, is not adapted to this zone, but was the only variety of which certified seed was available. Next year it may be worth seeding the peas and barley separately to ensure that the correct seedrate of each is obtained. Also locally adapted varieties should be used a fact that the project has in hand as they are now multiplying seed for next season to ensure they have seed available of the required species and varieties.



Forage plot at one site in Oued Zem. The plot in the foreground was sprayed with glyphosate before seeding, while the plot on the left was not sprayed. Note also the predominance of peas in the pea/barley mixture.

Weed control in the wheat is uniform at each site, with decisions taken at each site on the best chemical control strategy. We discussed with the project personnel the possibility of applying strips of different herbicides as a learning vehicle, not only for farmers but also for researchers and extension personnel. Project personnel favoured one uniform “optimum” application to show what can be achieved, but I fear that this leads to the idea of general recipe recommendations rather than developing knowledge among partners, especially farmers, to allow them to make informed decisions on weed control. At the first site we visited weed control in wheat was poor as the weed expert, Abbas Tanji, had recommended delaying the post-emergence weed application so that 2,4-D could be included in the mix to control a problem weed at this site - *Bunium bulbocastanum*. Unfortunately this resulted in overall poor weed control.

At the first site visited a nitrogen trial had been superimposed on part of the wheat area. The planned phosphorus treatments had not been included, presumably because of the problem of incorporating phosphorus in no-till in small plots (25m²). The N fertilizer is broadcast on the plots –

as it is for the top-dressing of many (most?) commercial fields. The nitrogen trial has three replications per site and is repeated on three farms and on other farms under the ACLIMAS project.

The second site we visited was also pretty weedy. This is the farm of a local service provider, Mr. Elouafaoui (sp?). He was given the herbicide by the project team, but they did not participate in the application – leading to questions about whether the herbicide was applied, how, when etc.? It is very important that in the technical staff participate in the applications of fertilizer, pesticides etc. in the on-farm trials to enable better understanding of the results. Interestingly this service-provider farmer is not pro-CA because he sees that far less tractor time is invested in CA, and therefore he expects his income to fall if CA becomes widespread!

The wheat fields (here and in the majority of the fields we passed) looked short of N. The farmer said the variability reflected soil variation, which may be part of it, but I think nitrogen use in general was possibly too low. The wheat blocks of project farmers had received (?) 65N (27 basal and two top dressings of 24 and 16kg/ha respectively) and 67 kg/ha of P₂O₅ as DAP at seeding.



Atriplex growing in a very weedy forage plot in Oued Zem.

The last field we visited at Oued Zem was an alley-cropping site. The Atriplex had been sown last year by the Extension department for another project and has now been taken over by the CANA project. There were different forage crops seeded in the alleys, but these were very difficult to see as the field was very weedy. The project had decided that they could not control the broad-leaved weeds because of the Atriplex. However, this will make the system impossible as weeds are so prevalent. Atriplex could be protected from the herbicide during spraying but weed control is a necessity in these plots. There was evidently not an area of the forage crops without the herbicide (this is necessary as the main treatment in the trial is with and without alley crops with different forage crops as sub-treatments). Also this was the only farm where the alley crops are being tested so there are no replications.

Weeds are obviously a major problem in the area, exacerbated by the “weedy fallow” which is common, and is used for grazing. In the farmer discussion group later one farmer was worried about weed control in CA and what would happen over time if weed populations were reduced – what would happen to his grazing!

The project is undertaking the planned monitoring of the weed seed bank and weed populations. Ten soil cores per site have been taken from all “project farms” and weed populations in these are currently being evaluated in pots at the Settatt station by Dr. Tanji. Weed counts have also been conducted on each field prior to glyphosate application and prior to the application of the post-emerge herbicides. One more count of weed populations will be conducted during the remainder of the season. Soil samples have also been taken for the analysis of root diseases and are also currently being analysed at the Settatt station. One note on this: it seems that “soil health” in the work plan is being translated here as prevalence of soil-borne diseases, but to me soil health implies a much wider array of factors including soil structure, stability and resilience. If possible samples should also be taken this season for these more physical aspects of soil health.

For the analysis of soil chemical properties, paired fields under no-till and conventional tillage, seeded to three different crop rotations (bread wheat/forage crop -mixture of vetch and oat; bread wheat/canola; and bread wheat/grain legume -field pea) were to be sampled, but canola has not been sown (I think because of seed shortage). Samples have been taken from the other two rotations under no-till on three farms, but Dr. Oussama El Gharras was not sure whether they had been taken from paired, conventionally tilled fields, and will let me know later. It is important in this study of the evolution of soil chemical properties over time to also include the farmer’s check. While at the initial planning meeting I understood that this was a continuous wheat system, or a

wheat-barley “rotation” it appears that in fact a wheat-(weedy) fallow would be the most common farmer practice here. This needs to be better defined, and no doubt will be by the farmer surveys.

Three treatments of the residue levels trial (trade-off between surface cover and animal productivity) will be superimposed on three farmers’ fields as planned at the end of this season. However, at the Settata station there were to be four replications of the full(five-treatment) trial, but only one replication has been established.

The trials to test crop sequence options to enhance diversification and sustainable productivity and to assess soil physical properties on wheat under no- tillage and various crop rotations system have not been established this year. In the case of the first (cropping sequence trial) the team intends to look at the results of the ACLIMAS project (with the Univ of Lleida) and then decide how to proceed. At the Sidi El Aid Experiment Station (180 km N of Settata) they have a series of legumes to be followed by wheat, where they will look at WUE and NUE (3 N levels).

Farmers’ Meeting.

Farmers suggested that they have tried NT in the past and know that it works. However, the availability of adequate seed drills is the biggest problem. However, the Director of Extension believes that weeds are the biggest problem and that the Extension Department must concentrate on working with farmers on this aspect. One of the farmers stated that knowledge was the big limitation and that farmers need to gain knowledge on herbicide products for different weed spectra, sprayer calibration etc. and that a local Farmer Field School should be started. Interestingly the project has helped catalyse an Association of No-Till farmers. This is just starting up with government support and there are already over 100 farmer members.

March 27.

A short visit to some of the ACLIMAS sites near Settata before being curtailed by rain. Some of the farmers have been managing no-till systems for five years, starting with the Moroccan seeder developed at Settata, and then going on with the INRA-owned Semeato drill. The project is focusing on trying to increase the area under wheat-food legume rotations to replace the fallow – a system far better adapted to CA conditions. This is an important point to bear in mind during planning for next year’s work – while a control plot of the farmers’ current practice should be included in validation and demonstration plots, a no-till treatment with a wheat-weedy fallow system probably does not make sense. Here we saw the pea/barley mixture, evidently with the same seed used on the sites in Oued Zem, but here the barley is dominant, with very few, weak pea plants.

Conclusions and Recommendations:

1. The philosophy adopted by the Moroccan team needs to be discussed in depth at the upcoming planning meeting, and probably beforehand with the project coordinator. While the changes to the work plan reflect the moulding of the project to what the researchers feel are the local needs, the CANA project involves three countries, each with a platform representing conditions in the other two countries. As such it is important that the three teams follow similar, coordinated work plans to provide information for CA management under different conditions across the region, and to allow synthesis of results across the three platforms.
2. It would have been good to visit all of the CANA project sites on the visit. Although the visit to the ACLIMAS site was interesting, I believe that in future this traveling workshop should focus on the CANA sites, and that enough time to visit all project farms should be allowed. Staying in Settata rather than in Casablanca would help logistically by reducing travel time.
3. The idea behind the 10 farmer field sites this year was that these were to be sites for researcher-managed trials. The focus should be on learning, and therefore should include as many comparisons as possible, rather than applying blanket treatments at each site.
4. The Oued Zem site is fairly distant from the Settata station making it logistically difficult for the researchers to visit frequently. This leads to situations such as herbicide being given to farmers, but herbicide spraying not being done with the farmer. Solutions to this problem, such as greater involvement of the extension staff in the research programme, need to be analysed and solutions put in place.

Algeria.

We flew from Casablanca to Algiers on March 28, and met that afternoon with the Director of ITGC, Dr. Omar Zeghouane, who gave us an excellent background to agriculture in Algeria. Cereals are grown on 88.5 million ha (3.2% of the total area of the country) and there are 24 million sheep.

The Govt. initiated an agricultural stimulus package in 2008 and under this the production of most commodities (wheat, barley, milk etc.) has increased. Fertilizers and seed are tax free and there is a 20% subsidy on top of that. (Unfortunately this has led to some problems as companies have imported seed of unadapted varieties from, for instance, Spain, and these have not performed well). There are also incentives for machinery purchase – old machinery can be traded-in to purchase new machinery with a 70% subsidy. There is also subsidized credit, and irrigation water is almost free.

The research station at Setif is not only the home to the CANA project, but is also involved in work on CA under the EU-funded ACLIMAS project, and another IFAD-funded CA project with ICARDA.

March 29. Travel to Setif, orientation by project partners at the Setif Research Station, and visit two farm sites. The map of the sites visited are attached.

On **March 30** field visits to another five sites before driving back to Algiers.

Five per cent of the agricultural area of the Setif District is irrigated, and 11% (only) is dedicated to grazing and pastures.

Practically all the trials planned for this season have been established on 12 farm sites. There are evidently a total of 55 ha of trials seeded on the farms of the cooperating farmers this season. No-till seeding was generally done with the large (4m) Semeato seeder that needs a 150HP tractor – much bigger than most farmers use. The seeder and tractor were taken to the farm sites from the research station on a flat-bed trailer. At the sites we saw it was evident that the seeding discs of the Semeato were giving a lot of soil movement – more than I would have liked to see. The trials there seemed to be little difference in plant emergence and stand with the two seeders – Syrian (20 cm between rows) and Semeato (17 cm between rows). When there was a greater residue load (Site 6) the Syrian seeder tended to gather residues causing some seeding problems.

The survey of farmers is a bit behind schedule, but 40 farmers have now been interviewed. In the annual report it was stated that soil sampling was behind schedule, but this has now been completed.

The project only recently received the Atriplex plants from the organization that sells/provides these plants – as the project's needs were not programmed they had to wait. In the alley cropping trial (Site 6) herbicide has only been applied to the middle of the plot so as not to affect the Atriplex (which has been irrigated to get it established).. This will negatively affect the forage growth and probably diminishes any possible beneficial effect of the Atriplex. The management of the alley species and weed control in the plots needs to be discussed at the Planning meeting

Again weed control stands out as a major problem in the trials and in general in the region. In the trials, glyphosate is sprayed at 3 l/ha before seeding, but still control doesn't seem to be particularly good. We discussed various ways to increase the efficacy of glyphosate, and I am sure Allan Mayfield will cover these in his report.

There are five treatments in the crop succession trial – Wheat-Wheat; Barley-Wheat; Lentil-Wheat; Pea+Triticale-Wheat and a 2-year Chemical Fallow – Wheat treatment. The chemical fallow was sprayed once with glyphosate (3 l/ha) at seeding of the crops in the other treatments. They were going to leave this without further chemical weed control but we (Barry Mudge, Allan Mayfield and



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A photograph (from one of the field presentations) of a calcareous soil profile in the Setif area.

me) suggested that they really do need to have further applications to control weed seed-set and limit water extraction.

The seed mix of peas and triticale seems just right – 40 kg/ha triticale + 60 kg/ha peas. However, it was suggested (Salah) that, to get around problems such as we saw in Morocco, the peas and the triticale should be seeded separately. This has both pros and cons and should be discussed at the planning meeting. At all sites the lentil crop establishment was excellent although later there may be problems with weed competition.

Post-emergence weed control in lentils (and other crops?) is to be done with Fusilade. However, the herbicide is still not available (it is on the boat in the dock) and the team is not sure when they will be able to access it. Veronica spp. was a major weed at some sites (e.g. site 4).



Lentil stands seeded with the Semeato drill without tillage were excellent at all sites.

Fertilization of the cereals in the trials was 46N-46P₂O₅. At some sites the wheat looked short of nitrogen (e.g. sites 3, 5 and 6). Given the highly subsidized fertilizer price, maybe higher rates could be used. Some response trials and economic analysis would be very useful.

At one stage during the tour the farmers complained that they were being left out, because there was too much discussion in English, and that the signboards and information were also in English. This highlights the problem of combining different audiences and objectives in the study tour/traveling workshop.

One of the farmers (Bougandouz Abdelremi) who joined the tour farms well south of Setif with an average rainfall of 130-140mm. Last year with 107 mm he says that, using CA, he harvested 800 kg/ha of wheat and 700 kg/ha peas.

On **March 31** we had a discussion session with Omar Zeghouane, the Algerian team and the visitors from Morocco and Tunisia, followed by a brief visit to the research station in Algiers and lunch with Omar Zeghouane before flying to Tunis. A key

point in the discussion was the need to try and determine the benefits of the fallow, and the farmers “weedy fallow” to be able to better define strategies for system intensification.

Conclusions and Recommendations:

1. The Algerian team has done an excellent job of establishing all of the trials envisaged in the work plan. The description of the trials at each site and the summary of data acquired to date was very useful and impressive.
2. We suggested that this season Eng. Laouar Abdel Malek (aka Silim!) should visit Australia together with the project coordinator. The visit in the first year, rather than the last year of the project, we believe will enhance project efficiency.
3. We suggested that Eng. Laouar Abdel Malek needed more support, but the Director, Dr. Omar Zeghouane, suggested that the problem was rather that Laouar preferred to work alone. This is a point for reflection as project efficiency will not be achieved either by insufficient human resources dedicated to the project nor by limiting the number of active partners involved.

Tunisia

On April 1 we left by bus for the Fernana Valley in the Governate of Jendouba, a high rainfall (mean 820 mm/yr), undulating area some 28 km from the Algerian border in NW Tunisia. Two thirds of the area (the sloping land) is subject to water erosion. There are 25,000 ha of agriculture (52% cereals, 24% legumes), including 1,800 ha of irrigation,



Poor stands and soil erosion were seen on several of the CANA sites this season in the Fernana Valley.

largely horticultural crops. There are 4,200 farmers in the valley (so I calculate that average land holding is only 6 ha) – 52% of farmers have < 10 ha and 30% 10-20 ha. There are 14,000 sheep, 8,000 cattle and 7,000 goats

INGC has been working on a food security project with ICARDA over the last three years in the Fernana Valley. Farmers requested to include CA in that project because of the erosion problem, and so in many of the CANA sites trials were on fields that had been under CA for the last two or three seasons.

Erosion problems were evident in several of the plots. Plant stand, especially of the legumes, was poor at several sites, evidently due to the fact that seeding was late (because of planning and seed availability problems) resulting in waterlogging problems after seeding associated with heavy rainfall in December and January. Rainfall has been very high this season (up to 2000mm!). At the second site the vetch had not germinated, even though at some other sites the same seed had germinated well. A hard-pan meant that waterlogging was probably quite prolonged, and some subsoiling should be considered at this site. Germination of the vetch was also poor at the third site we visited. At the fourth site, the earlier seeded farmer's faba beans alongside the trial were very good, but both stand and growth were poor in the trial, again probably due to excess moisture after seeding, as well as hail.

Again weeds seemed to be an important issue, and most wheat and barley crops (not only the trials that have received 100N split between two top dressings) appeared to be a little short of nitrogen. The heavy rain in December and January caused problems with nitrogen and herbicide applications.

The team is measuring soil moisture at several sites. At one site they are using a TDR and at other sites it is being done gravimetrically

Cactus will be used in the alley cropping trial here, but will only be established in May. The two forage options in the trial are a triticale/vetch mixture and a triticale-alfalfa relay crop. The alfalfa will be sown into the triticale after this is cut in April. Previous results show that the cost of producing meat with Triticale/vetch is half cost of using a conventional fodder - 120g/day more weight gain than the conventional.

Farmers say that in general crops look better with CA and they see the benefits also of reduced costs and less erosion.



A general view across the valley. The pale colour of the cereal crops in the foreground suggested that the crops were a little nitrogen deficient.

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The prices of faba beans and wheat in the market are the same, but wheat yields about double the yield of faba beans (4.0-4.5 t/ha vs 2.0-2.5 t/ha).

A farmer from further south (Sidi Ammar) who is in the No-Till Farmers Association (APAD) says he has more medic, wild oats, ryegrass and poppy in no-till than with conventional tillage. Said that he thought that Malva had some resistance to RoundUp, but I think this is doubtful.

April 2. INGC's Koudiat station. This is one of three stations that INGC has in the country – the others are in Tunis and in the arid zone in the south, where they are trying to develop CA for irrigated conditions.

About half the station is under CA and half under conventional tillage. They say that the oldest CA plots in Tunisia are here – 11 years. In these plots soil organic matter levels have increased with CA from the original 1.5% to 2.4% over the eleven years.

They have a large trial which began under the PADAC project with France comparing CA with conventional tillage. That project is evidently now over, but the institute is continuing the trial, which is divided into two blocks of four reps each: In Reps 1-4 the Conventional treatment has two passes of a disc harrow and is cultivated and in Reps 5-8 it is disc ploughed to 25cm. 2t/ha of residues are left on all treatments. There are two phases of three rotations in the trial:

- Barley-Durum Wheat
- Oats-Durum Wheat
- Legume-Durum Wheat. This year the legume is fenugreek, but this changes from year to year.

In one trial, more Fusarium has been observed in the no-till treatments. Snails are also a problem on the station. Brome is a problem in years when there are no September/October rains and the weeds do not germinate before seeding and so cannot be controlled with glyphosate.

Meeting at INGC HQ in Bou Salem.

INGC has 24 engineers (graduates) and technicians. They are not a research institution, but have the mission of getting technology to the farmers. They have programmes in: germplasm evaluation, crop protection, cultural practices, regional dissemination activities (17 Governates), economic studies, and communications and publications. Funds come from a levy on grain production – 4.3 DT/t. Last year was a good year – 1 million tons grain produced but this year the national harvest will probably be only 0.6-0.7 MT grain, and so they will have a reduced budget.

INGC has a network of tensiometers around the cropped area of the country to study soil water levels and give recommendations to farmers on irrigation via SMS. Also have a network of early warning fields for crop diseases and transmit information to farmers on disease outbreaks, also via SMS.

Most important points from presentations:

- Socio-economic survey: Have surveyed 120 farmers of the 150 planned.
- Farmers with <20ha don't own their own equipment

Mechanization.

- Criteria for seeders: 1) Price; 2) For 55-75 HP tractors; 3) 2-3m wide.
- A course with Jack Desbiolles was planned for the following week with 5 people/country.
- INGC conducts field days for farmers and service providers in 11 districts where they go through calibration of seeders and sprayers.
- Mohammed Jadlaoui is developing a versatile implement for seeding and other activities based on the concept of Ken Sayre's seeder in Mexico.

Agronomy

- For weed seed-bank monitoring they took 35 soil samples from each site and are evaluating the weed seed populations in these.
- In the Alley Cropping/Forage Trial the team would like to include Sulla (*Hedysarum coronarium*) next year but are worried about how to include it in the existing trial layout. We will need to see that at the Planning Meeting.

- In the agronomy work some of the seed only had 50% germination which may explain the lower cereal populations at some sites. At the Planning Meeting it should be established whether poor stands (where they occurred) were due to seed viability or establishment problems.

Evaluation of root diseases at four project sites showed relatively high frequency of different *Fusarium* spp. at all sites. Take-all (*Gaeumannomyces graminis*) and common root rot (*Bipolaris sorokiniana*) were only found at one site and low frequencies of *Rhizoctonia* and *Pythium* at the same site. Soil samples have been taken and will be sent to SARDI, South Australia, to conduct the qPCR Predicta B Test to evaluate *Fusarium* and nematodes. The results of this will orient further studies on root pests and diseases in all three project countries.

Conclusions and Recommendations:

- The Tunisian team has done a good job of establishing all of the trials planned for this season, and all monitoring and survey studies are underway.
- Many different institutions are involved in the project and inter-institutional collaboration appears to be very good.
- The project coordinator in Tunisia, Dr. Halim Ben Haj Salah – Director of INGC, is unfortunately leaving to join ICARDA. Evidently the new coordinator will be Dr. Boubaker Thabet, Professor, Agriculture and Food Economics in the National Institute of Agriculture (INAT).
- This year there were problems with late seeding, exacerbated by the very wet conditions. Next season emphasis must be placed on having all inputs ready before the season and getting the trials established at the optimum time – evidently early November.

4. Other reporting

On April 3 and 4 I participated in the workshop on Water Use Efficiency given by Barry Mudge and Allan Mayfield. I believe that this concept is very important for the project, and for projects and sites where water is a limiting factor in general. The French-Schultz formula can be used in North Africa as a start, but it will be important to get local data to show project personnel and others the utility and applicability of this concept. Soil water has evidently been measured at some sites in the project this season, and this data needs to be carefully evaluated at the planning meeting in September to define a strategy for further data collection, which may require additional equipment.

5. Possible communications use

To be decided by Dr. John Dixon.

6. Knowledge sharing

See photos of principal contacts in Appendix 3.

7. Security

No issues. In Algeria we were accompanied by an escort car on the trip to Setif, evidently at the request of the Australian Embassy in Egypt.

7.1. Appendix 1 – Trip Itinerary

7.2 Appendix 2 – Map of CANAsites visited near Setif, Algeria.

7.3 Appendix 3 – Photographs of principal CANA project personnel.