

HEALTH HAZARDS ASSOCIATED WITH THE RAHAD AGRICULTURAL SCHEME (RAS): SPECIAL REFERENCES TO WATER RESOURCES

BY

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ABSTRACT

There is drastic impact of the Rahad Agriculture Scheme (RAS) on the human population living in and around the area. The life of those who are living under this relatively new created environment was changed forever. The availability of permanent water helps to increase health standard, education, immigration and a general change in living standards. When the RAS was planned, the great expectations of an economic boom were shadowed by the fear of Malaria, bilharzia and the side effect of the use of pesticides and herbicides.

There is no doubt that, soils, wildlife, water and air have been affected as well as the crops. Malaria is now considered to be the most serious disease in the area. Numbers of those infected with malaria increased from 4.5% in 1985 to 15.6% in 1991. Bilharzia was not known in the area before 1974 but by 1990 the infected people were more than 2515 making up 25.6%, some cases of cholera were also reported. Few cases of typhoid among children were reported by 1991. The long-term of this practice will remain to be seen by future generations.

المخلص:

هنالك تأثيرات جذرية ناتجة عن إنشاء مشروع الرهد الزراعي على سكان المنطقة حيث أن المناخ الجديد أدى إلى تغيرات في حياة الناس. أن وفرة الماء الدائم في القنوات والترع المفتوحة أدت إلى تأثيرات في الصحة، التعليم، الهجرة ومستوى معيشة الإنسان بصفة عامة. كان الخوف وارد منذ تخطيط المشروع من تفشي وباء الملاريا والتيفويد والبلهارسيا والأعراض المختلفة لاستعمالات الأسمدة والمبيدات.

ومما لا شك فيه أن التربة والحياة البرية والماء والهواء قد تأثرت كثيراً، هذا إلى جانب الأثر الناتج على المحاصيل. تعتبر الملاريا حالياً أكثر أمراض المنطقة انتشاراً حيث كان المرض محدوداً عام 1985 بنسبة 4.5% فقط من سكان المنطقة وفي عام 1991م ارتفعت نسبة المصابين إلى 15.6%. مرض البلهارسيا لم يكن أصلاً معروفاً بالمنطقة قبل عام 1974م حيث أن طفيل المرض يرتبط أساساً بالماء وحيث وجود الماء بالمشروع أدى إلى إصابة أكثر من 25% من جملة السكان بالمرض. أيضاً وضحت الدراسة وجود بعض حالات التيفويد والكوليرا وخاصة وسط الأطفال الشئ الذي لم يكن معروفاً قبل إنشاء المشروع.

أن استمرار استعمال المبيدات والأسمدة وتوفر الماء في الترع والقنوات المفتوحة سيؤدي إلى آثار طويلة المدى ستتعرض سلباً على الأجيال القادمة.

INTRODUCTION

The RAS is located on the Eastern bank of the River Rahad totalling an area of about 2800 km² (140 × 15 – 25 km). The major part of RAS falls within the Central Region and a section of the scheme lies on the Eastern Region. It lies between latitudes 14° - 35° N and 14° - 43° N and longitudes 34° - 22° and 35° - 55° E (Fig. 1).

The drastic impact of the RAS on the human population living in and around the area was one of the main reasons for the choice of this article. The RAS is one of the largest schemes in Africa. The lives of those living under this relatively new created environment, is expected to change. The availability of permanent water, leads to much health, education, immigration and a general change in living standards.

MATERIALS AND METHODS

- Two trips were conducted to RAS area to collect data concerning the subject. Water samples were collected from different sources in Al Faw Town.
- Visits to Al Faw hospital and some small dispensaries to survey types of diseases.
- Visits to Blue Nile Health Project (BNHP) offices to meet and discuss the health state in the area.
- Data from fields documents were collected concerning the subject.

Water Resources: Continuous search for water by the locals takes great effort and time of all the family members and the job is harder during the very dry months March-May (Plate 1).

The main water sources in and around RAS are water reservoirs (hafeers), water-collecting sites by seepage (gammams), hand-dug wells, borehole wells, the Rahad Main Canal and rainwater.

(i) Water Reservoirs (Hafeers): Traditionally 'Hafeers' were dugout areas to collect rainwater and were owned by a village or tribe. Large stocks of cattle, camels and sheep were observed resting in the vicinity of those 'Hafeers'. The site is popular with children collecting water and transporting it on their heads, or by donkeys or rarely by tanks driven by mules' carts or cars. However, there is a health hazard among children swimming in the 'Hafeers' in addition the water is drunk directly without treatment and is shared by the villagers as well as the transporting donkeys.

(ii) Water Collecting Sites by Seepage (Gammams): These are normally dug on sandy soils and they rarely occur on heavy clay soils. All gammams found in the area have more water supply for domestic use, for nearby villages. Though some dry up by November, a few continue to provide water till the commencement of the next season.

(iii) Hand-dug Wells: The depths of hand-dug wells vary from 2 to 35 m. The best wells are those that do not dry up in Summer.

(iv) Bore-hole Wells: These are comparatively few and are constructed by the local authorities. They are the source of healthy water for human use. Because they have a permanent water supply, large numbers of livestock use them daily during the dry four months.

(v) Water of the Rahad Main Canal: The main canal represents a great health hazard because of the various transmittable dangerous diseases. Villages in the vicinity of the RAS depend on the main canal for their water supply, though some villagers, being aware of the hazards, avoid using the canal water^[1].

(vi) Water Services at Al Faw Town and the Vicinity: At the project area, one well only exists at Abu Ashusha. Al Faw town and other planned villages, use the water supplied by municipality, which come from the main canal filtered and distributed via a network of pipelines. Water consumption is chargeable by the local municipality.

RESULTS

Water Analysis: Water samples collected from different localities during 1991 were analysed for their total dissolved solids (T. D. S), which is considered as one of the

most important parameters judging water suitability for human consumption. The results of the analysis are given on (Table 1 and 2).

According to WHO guidelines for drinking water, the range of T. D. S should be in the range of 150-1000 PPM with an optimum of 200-500 PPM. However, each country can specify its limit for T. D. S according to its own standards. In Sudan, the range (130-1500 PPM) is stretched beyond the WHO limits, which are broad values for the whole world*.

The results of T. D. S. showed that, all the values are within the guidelines of Sudan Ministry of Health (100-1500 PPM).

The water sample of the Rahad Main Canal showed a T. D. S. of 252 PPM. In spite of its good results, it is the source of many gastrointestinal diseases, if used without filtration.

Table (1): Results of Water Analysis for T. D. S. Of Samples Collected 23.5.1991.

Sample No	Locality	Depth (m)	Appearance	Weight of empty dish+w. Of total solids (gram)	Weight of empty dish (gram)	Value of total dissolved solids (P. P. M.)
1	Boundary Between Zone 1 and Zone 2	Surface	Clear	48.11490	48.08000	698
2	Zone 1: Bir Mustafa	10.5 m	Clear	51.61130	51.6061	194
3	Zone 2: 'hafeer'	Surface	Clear	44.09410	44.07925	279
4	Zone 2: 'khor'	Surface	Clear	47.47211	47.4650	142
5	Harera 'Old Faw'	Surface	Turbid	45.20670	45.18672	400
6	Rahad Main Canal	Surface	Turbid	48.24160	48.2290	252

Table (2): Results of Water Analysis for T. D. S. Of Sample Collected 6.10.1991.

Sample No	Locality	Depth (m)	Appearance	Weight of empty dish+w. Of total solids (gram)	Weight of empty dish (gram)	Value of total dissolved solids (P. P. M.)
1	Boundary Between Zone 1 and Zone 2	Surface	Yellowish	47.45691	45.44359	260
2	Zone 1: Bir Mustafa	10.5 m	Turbid	45.2150	45.19214	460
3	Zone 2: 'hafeer'	Surface	Clear	48.23520	48.22750	150
4	Zone 2: 'khor'	Surface	Turbid	47.46822	47.44792	510
5	Harera 'Old Faw'	Surface	Clear	45.21063	45.18723	460
6	Rahad Main Canal	Surface	Turbid	47.44630	47.43350	280
7	Id Al Faw: Well No 11	10.5	Yellowish	48.09773	48.07952	360
8	Id Al Faw: Well No 13	10.0	Brown	51.68900	51.61953	1390
9	Id Al Faw: Well No 25	10.0	Brown	44.14432	44.09410	1000
10	Id Al Faw: Well No 32	9.0	Brown	45.25427	45.189380	1290
11	Pore-hole well	32.0	Clear	48.24044	48.21990	410

DISCUSSION

Traditional agriculture can no more cope with the ever-increasing population size and famines became a sustainable feature, once communities are established. There is no doubt that in the developing countries, large agricultural schemes helped in the survival of their comparatively very large population over many years^[2].

Various modifications of the old systems of life took place but not without various social and ecological problems. These include water-borne health hazards and pollution from the extensive use of fertilizers and pesticides in the fields. Such

* Mahajoub Mohamed Taha: Director, Khartoum Water Corporation.

pollutants find their way to the water resources either directly or via seepage to the groundwater^[3].

In the Sudan illiteracy plays a major role with carelessness in application and handling of chemicals. Many farmers are not able to read the prescriptions in use and empty containers are used to transport water, milk and to store food. Vegetables may after spraying, soon picked and sold to consumers. Crop harvesting may immediately follow spraying. Many persons were seen eating salad items in the market place without first washing them. Bare hands, followed by eating, drinking and smoking in freshly sprayed fields, handle pesticides is a common practice, within these communities.

There is no doubt that soils, wildlife, water and air have been affected as well as the crops. Focus on the outcome of long-term use of chemicals on the health of the local population in large agricultural schemes should be a governmental policy.

Irrigation has increased food production drastically but not without a price. The Gezira Scheme, a very large irrigation scheme with the continuous presence of open waters provided a media for the breeding and spreading of the anopheles mosquitoes and snails. The former is the final host for malaria and the later harbors the intermediate host for bilharzia^[4].

MALARIA

Malaria now considered the most serious disease in the Sudan causing the highest death toll and the numbers of those losing their life to malaria is on the increase.

The local experience of health hazards in the Gezira Scheme naturally raised panic and fear when the Rahad Agricultural Scheme was proposed. An agricultural scheme of the scope of the RAS with large open water would induce more malaria, more bilharzia and more death in a country too poor to cope with it or even control it.

In 1977, a team of investigators from the University of Khartoum conducted a survey of malaria infection in the area. Only few cases were reported and those infested with Bilharzia were 'unnoticeable attacks' those few cases reported were attributed to seasonal labourers from the Gezira Scheme^[5].

In 1980, after the completion of the resettlement and the completion of the irrigation canal network, incidences of both diseases have arisen drastically. Health centers with health officers to monitor both diseases were established and in 1981, there was one rural hospital with two physicians and 20 beds.

It is unfortunate that the Sudan's economy is dependent on an agricultural system based on a network of irrigation canals. Spraying with DDT was carried twice a year: before and after the rains. DDT use was prohibited by WHO, yet the local authorities continued to spray with DDT to control malaria attacks during the 2-3 years of the RAS establishment. Unfortunately the use of DDT, in spite of its known hazards is continued. It was only stopped when its level in human milk in the Gezira State become as high as 0.23 ppm compared to the maximum level set by WHO for cows' milk at 0.05 ppm^[5].

The recent increases in the incidence of both malaria and bilharzia have been attributed to the shortage in funds. By 1992, five years had elapsed without any form of spraying or control and the death toll was tragic.

(Table 3) Shows the numbers of those infected with malaria for the period 1985-1991.

Table (3): Numbers of Infestations with Malaria 1985-1991.⁵

Year	Numbers checked	Numbers infected	Percentage infection %
1985	1698	81	4.5
1986	2237	220	9.8
1987	2400	5	0.2
1988	8958	460	5.0
1989	9815	406	4.0
1990	6680	1146	17.0
1991	7784	1214	15.6

BILHARZIA

Another water-borne disease that flourished with the construction of the open-water canal system or the irrigation system is bilharzia.

The bilharzia parasite is dependent on the aquatic snails as their intermediate host. The snails flourished with the availability of aquatic weeds and the water media provided by the irrigation system. The disease has since become the second most serious disease in all areas of the Sudan with an irrigation system.

In 1977, the disease incidence was reported as negligible. However, since then, bilharzia has been on the rise. The only method for effective control is the provision of healthy drinking water for man and domestic animals. So far, the RAS has failed to provide this to all locals with the result that adults and children frequently visit the canal for bath and collect water, which is commonly contaminated with DDT. In spite of all efforts of control, bilharzia infection is on the increase. Cases of infection in the Schemes planned villages were recorded by the Ministry of Health in 1984 amongst school children in 26 villages 60% were infested. By 1987, the number decreased due to a lot of efforts to 10%.⁶ Unfortunately the rate of infection had since increased due to the rise in the population with insufficient supply of filtered water leading to the continual use of canal water for human and animal consumption. (Table 4): Portrays the data on bilharzia in the project area from 1983-1991.

Table (4): Bilharzia Cases in the Project Area for the Period 1983-1991.

Years	ADULTS			SCHOOL CHILDREN		
	Total No. Investigated	No. Infested	%	Total No. Investigated	No. Infested	%
1983/84	6256	330	5.2	-	-	-
1985	15004	2249	15	-	-	-
1986	29902	6464	24	17211	2551	4.8
1987	35082	7891	25	19775	2491	12.9
1988	30462	7630	25	20261	3811	17.1
1989	35881	8176	22.8	22427	3417	15.2
1990	9803	2515	25.6	26911	4212	15.8
1991	7779	1812	25	-	-	-

Source: Rahad Project Health Service office, 1992.

Other Infectious Diseases: Malaria and bilharzia left no place for other fatal diseases to compete. In spite of this, the famine of 1983 brought immigrants from western Sudan to the area-with cases of Cholera. Immediate action to control its spread proved effective and no deaths were reported.

Other infectious disease associated with poor sanitation and poor water supplies are quite a few. Typhoid cases, in particular amongst children prompted vaccination programmers resulting in control and no death was reported.

Amoebic and bacillary dysentery, hepatitis, gardia, ect. Come up in spells with one death reported. Diarrhoea from various causes is a common feature especially in children, which in some cases resulted in deaths. In 1975 the incidence rate was

19%.^[7] However, with the increase in clinics and hospital facilities the success of its control preventing death has increased.

Other disease includes anaemia from malnutrition and common eye infections. The latter is probably due to poor sanitation and both are treated at the local health centres.

Herbicides and Weed Control: The scarcity of labourers with the expansion of cropped area, the attendance of the farmer's children to day school, the desertion of the young from the Scheme to urban area and the reluctance of farm labourers to do the tedious hand weeding operations have all led to a considerable rise in the cost of hand weeding coupled with a steady increase in annual and perennial weeds. This situation encouraged the increase in the use of herbicides in irrigated RAS fields in the production of the cash crops such as cotton, groundnuts, sorghum, vegetables and trees.

Among the herbicides used are: 2, 4-D and Fluzifop p-butyl. Common weeds include: *Brachiaria eruciformis*, *Phyllanthus niruri*, *Sorghum spp.*, *Ipomoea spp.*, *Rhynchosia minima*, *Corchorus fascicularis*, *Dinebra retroflexa*, *Ocimum basilicum*, *Ischaemum afrum*, *Thumbergia annua*, etc.

The Scheme encourages the use of herbicides as well as manual methods. The use of herbicides as well as pesticides increases year after year. Over 150 tons of both are used in the control of weeds and insects of crops and horticultural plants in the peruse of better quality products. The long-term effect of this practice will remain to be seen by future generations.

CONCLUSION AND RECOMMENDATION

This study concluded that, open irrigated system used in the RAD area encourages different types of water-borne diseases that were not known before the establishment of the scheme. Malaria as one of common disease in the Sudan started to spread out from the beginning of the scheme. More efforts are needed to control it. Bilhariza, although, it is frequent, but still has it effects on the human population of the area. Other diseases were controlled and no serious deaths were observed. More studies are needed to look for the effect of the use of insecticides, herbicides, and fertilizers.

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