

SOCIAL AND ECONOMIC IMPACT OF CHERNOBYL IN TURKEY

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1. INTRODUCTION

The radiological impact of the Chernobyl accident in terms of doses to individuals in the various countries covered a wide range. The specific features of the release of radioactive material from the Chernobyl accident, particularly its relatively large duration and altitude reached by the radioactive plume, caused a widespread distribution of activity across Europe. Meteorological conditions and wind regimes during the period of release were the contributing factors. The varying distances from the source of release and long duration of the release in different directions resulted in uneven ground and foodchain contamination. Also, variable meteorological situation, characterized by frequent and localized heavy precipitation contributed to uneven deposition differs sometimes by one or two orders of magnitude between localities situated few tens of kilometers apart. In these circumstances, the doses to the individuals of critical groups appeared to be higher than the average individual dose over whole population.

2. MATERIALS AND METHOD

The progressive spread of contamination at large distances from the accident site was a considerable concern for most countries in Europe. In Turkey, the Turkish Atomic Energy Authority (TAEA), as the national competent authority, deployed 15 competent personnel to the northwestern region of Thrace on the 30th of April 1986. Airborne radionuclides reached the ground by heavy rain showers on the 3rd May. Upon observation of an increase in the concentration levels from a normal background of air, TAEA recommended taking appropriate actions with a view to making as effective as possible arrangements for the region, in order to reduce the impact of the accident. Advice was given by the 2nd May that fresh rainwater should not be drunk. There was of course a high level of activity on grass. This was expected to be transferred into cows' milk. In May, cattle were already out grazing grass while it was the spring time. In order to minimize the problem of iodine contamination in milk, feeding dairy cows with green forage was stopped and cows were taken from pasture and were fed on supplementary foodstuffs then a ban was introduced on the consumption of fresh milk for about the first three weeks of May 1986. Fresh milk from dairies to the population handed out when the activity of I-131 decreased to 500 Bq/L. One of the most effective action taken was to reprocess dairy milk with higher activities so it was converted into storable dairy products, accordingly, population was less exposed to radiation from milk with a higher I-131 contamination. In the region of Edirne 4000 cattle were quarantined by district government. This was because some breeders had let their animals out to pasture without having knowledge of countermeasures taken.

Special feeding (feed with Caesium free or low fodder) was used for a given period of time. Levels of radioactive caesium up to 4000 Bq/kg were measured in cattle that were put in quarantine. Compensation granted to breeders whose cattle kept in the special feeding program was amounted to about US \$ 50000 for eight months [1]. After the program proved to be effective, cattle were approved for slaughtering. Also, the countermeasures ranging from simple advice or recommendations to the public such as washing fresh vegetables and fruits before consumption, up to the adoption and legal enforcement of compulsory measures were taken. In the first week of May 1986, radioactivity released was transported to the Black Sea region of Turkey. Part of the activity that came down on the ground was deposited on plants. That part of country is a climatically favored region where plant growth had already advanced substantially in early May 1986. Hazel, tobacco and tea plants were the most vulnerable ones among the others. Also, these three are very important commodities for both local and foreign markets. Therefore special care was given in measurements of hazelnut, tobacco and tea.

At the beginning of May the caesium isotope, like I-131, adhered to the external surface of plants which could be rinsed off. Later on, the water soluble caesium compounds were incorporated through the leaves' surface and distributed via the plant capillaries. This led to fruits and seeds harvested in autumn contain Cs-137. Consequently, leafy plants such as hazel, tobacco and tea showed considerable contamination.

For the following years in which uptake by plants of Caesium isotopes from the soil, taking into account that caesium is bound relatively tightly to soil minerals, this uptake through the roots, was small.

While efforts are being made, as the lead technical part, by the TAEA, there was also a clear need for organizing a committee dealing with the ways and amplitude of the information to be given to the public, responsibilities to be distributed and efforts to be made fully effective. On the 26th May 1986 the Turkish Radiological Safety Committee was established. The committee was consisted of the TAEA, the Ministry of Health, the Ministry of Agriculture, the Ministry of Industry and Commerce, the Ministry of Environment and Undersecretariat of Foreign Trade and Treasury. The Minister of Industry and Commerce was the governor of the committee. This committee considerably facilitated enhancing decisions about protective actions ranging from adoption of any countermeasures to compulsory restrictions concerning the commerce and use of foods taking into account that a particular problem raised by the transboundary character of the Chernobyl accident.

In view of air masses containing large amount of radioactive material passed over mainly the eastern part of Thrace and the northern part of Black Sea region of Turkish territory and during the first few critical days, rainfall caused deposition of significant amounts of radioactivity in certain areas, extensive measurement have been carried out on foodstuffs during the first year after the accident. Activity concentrations measured in the most important foodstuffs were found to be safe for consumption. Major part of the country received an almost negligible contribution from the accident. This made facilitated gathering the most important categories of foodstuffs. Efforts were mainly spent to reduce effects of economical impact on hazelnut and tea which contained considerably high activity and were main agricultural products of the Black Sea region. Activity concentration was found to be very low in tobacco.

Radioactivity levels in hazelnut were measured by a laboratory particularly appointed for this task. In accordance with the decision made by the Turkish Radiological Safety Committee, 1986 production of hazelnut was purchased by the Union of Cooperatives of Hazelnut Crop and Production. Thus control over consumption of hazelnut was achieved. Also, taking into account that transboundary character of the Chernobyl accident impacted on the international trade of foodstuffs, a great number of radioactivity measurements on hazelnut carried out and results were classified in three groups based on DIL of 600 Bq per kg adopted by CEC, 2000 Bq per kg recommended by WHO and varied acceptable limits established by some other countries [2]. This facilitated trading of the production of hazelnut for 1986 and allowing 140000 tons of hazelnut to be saved from destruction. In addition, the Turkish Radiological Safety Committee decided to raise the action level considering hazelnut is of no importance of forming a significant part of the dietary habits of the Turkish population (annual average consumption is 100 g per capita). Therefore, 5000 tons of hazelnut of which activity limits above 2000 Bq per kg was justified to use in domestic consumption [1].

The main impact of the accident was on Turkish tea. It forms an important part of the diet of the Turkish population. Most of the Turkish people are in the habit of drinking several glasses of tea on average every day. Activity levels up to 30000 Bq per kg for caesium in ready-to-use tea were measured in Autumn 1986 [2].

The Turkish Radiological Safety Committee taking into account consumption of tea is based on brew of tea and considering all the activity is transferred to the brew and a glass of tea is prepared by diluting the brew with added hot water, adopted 12000 Bq per kg for dry (ready-to-use) tea as the highest limiting value. In this case on the bases of the maximum activity concentration assuming a few grams of dry tea is used daily per capita would yield an effective dose amounting to 0.20 mSv for adults per year due to tea consumption was expected for the year 1986 [3].

In order to reduce radioactivity levels for total caesium in tea of 1986, 55000 tons of tea stock in hand from previous year was used for blending in accordance with the decision made by the Turkish Radiological Safety Committee in October 1986.

The process of mixing of tea was carried out under control of the TAEA, within three months, the highest level in tea was reduced to 3000 Bq per kg. After all these countermeasures taken there was still 58000 tons of tea in hand activity concentrations of which was above 12000 Bq per kg [2]. This amount was kept, in about 40 depots of different factories from consuming as a safety measure. Afterwards, the Radiological Safety Committee decided the burial of this quantity of tea following a technical report prepared by the TAEA on the subsequent management dealing with disposal alternatives such as incineration and burial.

In 1989, tea in storage was disposed in selected several ground repositories.

The valuation of the disposal of tea which could not salvaged from condemnation was estimated at \$ 100 million in the price of 1986. This value represents the main economic loss to the agricultural sector by the Chernobyl accident. During the three years after the accident almost all important foodstuffs were monitored and activity concentration levels for caesium found to be substantially low.

3. RESULTS AND DISCUSSION

In spite of the fact that, when looking back, a significant efforts has been made by the national authorities forming the Turkish Radiological Safety Committee, particularly as the lead technical part by the TAEA, the events and the consequences of the accident were considerably exaggerated and discussed in completely a very emotional way in Turkey. After several years when repercussion of the event began to fade away, some newsmedia from time to time to increase their circulation has deliberately attempted for renewal of public attention bringing forward assertions and allegations that TAEA had been subservient to the government and the limit values especially for tea were laid down too late and further, official measurements gave too low levels which were sanctioned by the TAEA. Moreover, in 1993 an increase in the incidence of leukemia in several provinces were alleged and this was asserted to be related to the radiation exposure due the accident at Chernobyl.

The data including pre-Chernobyl incidences was thoroughly examined and the Ministry of Health pointed out that the number falls within normal variation and that there are no incidations of Chernobyl related leukemia [4].

As for lessons drawn from Chernobyl accident; First, the demand for monitoring was overwhelming. This included monitoring of the environment, of foodstuffs, of the people and so on. This show that available resources must be expanded. Second, there is a need for better communication with public. It must be explained the doses may be small, but the activity is measurable and acceptability of the assumed risk must be taken account.

As a result, radiological protection concepts proved to be difficult and contributed to confuse the public about what was safe or simply prudent and what was only the result of misinformed fears and psychological reactions to the accident.

The Chernobyl experience has stressed the importance of a national coordination of the emergency management. In view of this, the TAEA prepared the national plan cover accidents occurring neighboring countries and submitted to the approval of related national authorities. The plan also gets provincial authorities into emergency response. From the point of view that the effects of an accident in a foreign nuclear power plant could require action in any part of the country, the national plan assigns specific responsibilities to the various national authorities. Provisions are being made especially for the Armenian VVER nuclear plant located at a distance of about 30 km from the border to Turkey. In this context, execution of an emergency exercise has been decided to be incorporated in the national plan.

After the Chernobyl accident, an Early Warning Environmental Radiation Monitoring System (EWERMS) has been setup on various locations taking into account their topographical and climatic characteristics as well as distances from nuclear power plants in neighboring countries. At present 32 radiation monitoring stations are under operation and still there is an ongoing project entitled "Strengthening of Radiation Protection Infrastructure in Turkey" aimed at completion of an efficacious environmental monitoring system and updating of regulations with respect to recent developments in radiation protection philosophy.

REFERENCES

- [1] ÖZEMRE, A. Y., Report by Ex-President of Turkish Atomic Energy Authority, 1992
- [2] Grand National Assembly of Turkey, "Çernobil Kazasının Etkilerini Araştırma Komisyonu Raporu", Ankara, 1993
- [3] Turkish Atomic Energy Authority, "Türkiye'de Çernobil Sonrası Radyasyon ve Radyoaktivite Ölçümleri", Ankara, 1988
- [4] Turkish Ministry of Health, "Çernobil Nükleer Santral Kazasının Türkiye'deki Etkileri ile İlgili Bilimsel Kurul Raporu", Ankara, 1993