Agro-industry

Contents

1. Scope

The agro-industry is based on **agricultural and forestry production**, and its purpose is to **preserve** and **refine raw produce** and to **extract** and **concentrate** the valuable **constituents**. The **food industry** constitutes the most important sector of the agro-industry.

Many agro-industries have developed from skilled manual production processes and accordingly can be carried out at varying technical levels. The following information, however, applies to **small and medium-sized operations**. The definition of small and medium-sized operations varies from country to country but a maximum of **100 employees** can be taken as an upper limit. There are **environmental briefs** which focus **specifically** on a number of agro-industries, particularly **large plants**.

In no other area are development and environment so closely intertwined as in that of the agro-industry. Unforeseen implications can turn intended impacts on their head, and medium and long-term damage may prove to be of short-term benefit. Nowhere are effects on the biosphere -including human society - so all-embracing as in the agro-industry. And no other sector is so dominated by female employment; all the activities in this sector are of major importance to and have major effects on women. All agro-industry activities depend essentially on the limited time women have available, their extensive responsibility and on limited water and energy resources. This is why the socio-economic parameters and influences are priority issues in agro-industry projects.

A distinction can be made within the agro-industry between **primary, secondary** and even **tertiary processing**. **Primary processing is** basically **most suited to small industrial operations**, as technical input increases in line with processing complexity.

2. Environmental impacts and protective measures

2.1 The agro-industry generally

As the agro-industry will probably increase the demand for certain commodities, or alternatively push towards different forms of land use and farming, the following environmental impacts in the area of agricultural production should be mentioned:

Problems relating to the direct expansion and intensification of resource usage include impairment of soil fertility, problems of soil losses and sedimentation, problems of desertification and irrigation problems (soil and water salination, fluctuating water table and water pollution), which in turn reduce resource productivity. The problems of fertility losses, desertification, and salination are generally greatest in countries where the population pressure on land is greatest. Here, agriculture expands most markedly in peripheral areas and marginal resources are utilised intensively.

The most successful efforts lie in the promotion of soil-conservation measures: reducing the intensification of soil usage, and introducing programmes for minimum or soil-conservation farming (contour line farming, terrace farming, strip farming, extension of dry and green fallow land), programmes to control flooding and wind erosion and programmes for the improvement of crop rotation. What needs to be examined is the extent to which these measures should be implemented as an alternative or in addition to the establishment of agro-industrial production operations.

The economic and social parameters in place and those sought are decisive factors in the agro-industrial sector generally. The maintenance and promotion of subsistence production and agro-industrial activities without restricting subsistence are major axioms in this respect.

Commodity processing gives rise to environmental impacts on the atmosphere (odours and dust emissions), water (quantity and wastewater), primary energy sources (mainly timber) and the soil.

The following comments are confined to certain branches which have been in the greatest demand in recent years.

2.2 Selected branches

2.2.1 Mills handling cereal crops

Only **dry milling** is carried out in such plants, thus account must be taken of **noise and dust emissions** which affect not only the specific operational area but also the area surrounding the mill. Suitable countermeasures are **technical installations** (extraction, soundproofing) and **individual measures** (breathing apparatus, hearing protection), priority being given to the first group, since the use of individual safety equipment requires explanatory and supervisory measures.

Surface water quality is impaired in cases where streams and rivers are used for waste disposal, for example. Further usage or controlled dumping are suitable **countermeasures** (cf. environmental brief Mills Handling Cereal Crops).

2.2.2 Processing of starch sources and root crops

If the **biologically polluted wastewater** from washing and processing is discharged into surface water untreated, the result can be **overfertilization, reduction in the oxygen content** and therefore a general **impairment of water quality, changes in the micro flora and fauna** and, in the medium term, **disruption of water biotopes**.

Appropriate minimum measures are **mechanical separators and aeration ponds** in which the biological oxygen demand is reduced to an acceptable level. Since a reduction in the biological pollution of wastewater is associated with improved yield, **optimised process technology** can also be an economically beneficial environmental measure. Finally, highly polluted wastewater which can normally be avoided where a process is appropriately optimised, can be used as a **substrate for biogas production**.

2.2.3 Processing of oil-bearing seeds and fruits

In small and medium-sized works, only **pressing processes** are used for oil extraction, with solvent extraction reserved for large plants (see also the environmental brief Oils and Fats). Oil-bearing fruits are heated directly or with steam or hot water to improve yields. This produces **steam emissions** and oil-laden **wastewater**. **Wood** is often used for **energy production**, and this can lead to **over-use** of tree stocks.

Because **steam emissions** affect mainly operating personnel **extraction** should take place at the point of production. Once again, process optimisation, the use of better separators and treatment in aeration ponds should be used to **reduce wastewater pollution**. Consumption of wood or other commercial **fuels** can be reduced by incinerating the waste produced in the processing operations and also by optimising energy circuits and consumption in the processing plant.

2.2.4 Sugar beet and sugar cane processing

The essential environmentally relevant aspect of beet and cane processing is the **energy required** for the concentration of the sugar solution. While this requirement can be met in cane processing by burning bagasse, energy consumption in sugar beet processing must be optimised and, if necessary, alternative energy sources must be identified.

Mention should also be made of **organically polluted wastewater** from purification and condensate.

There is an **environmental brief** specifically relating to Sugar.

2.2.5 Fruit and vegetable processing

Biologically polluted washing water and the **energy requirement** for thermal preservation processes are of environmental relevance in this area, and the same comments as in the previous sections apply. **Solar driers** can also be used, thereby reducing the energy required for the production of top quality dried products quite considerably.

2.2.6 Dairies

As milk and dairy products are ideal breeding grounds for microorganisms, **hygiene requirements** are relatively stringent, a factor which prompts the use of **aggressive cleaning agents**. If they are discharged at certain concentrations, the quality of **surface water** is impaired and micro flora and fauna are affected.

Countermeasures are the sparing use of **biodegradable cleaning agents** and dilution in tanks.

Mention should also be made of **percolating milk** in rinsing and washing water as a source of organic pollution.

2.2.7 Processing of semi-luxury goods and spices

The operations having the greatest environmental relevance in the production of semi-luxury goods and spices are fermentation and waste disposal. **Fermentation** is generally carried out in fixed locations, and the **pollutants** thereby produced can **accumulate in the soil** over long periods, **damaging micro flora and fauna**. The washing operations sometimes carried out after fermentation (e.g. coffee) give rise to **biologically polluted wastewater** which, if discharged untreated, can impair **surface water quality**. The impacts of this are restricted to harvest time, and are then found over longer intervals.

Fermentation should be carried out in the immediate vicinity of an abundant supply of running water at appropriately prepared places (cement bases). The heavily polluted wastewater produced must either be suitably diluted before discharge or used for **biogas production**. As washing water is not generally so heavily polluted, special measures (aeration ponds) are only required in exceptional cases. Spices are often irradiated as a method of preservation, although the consequences of **irradiation** on human **health** are as yet unknown.

2.2.8 Plant fibre extraction

In many countries, **microbiological retting** is practically the only method of plant fibre production in use. It involves the degradation of non-fibrous components by a microbiological process and is carried out by immersing the raw material either in a slow flow of water or in specially prepared tanks, whereupon the retting is spontaneously initiated. Since this process and the subsequent fibre washing require **large quantities of water**, these installations are always built close to abundant supplies of running water. In these circumstances, the water exchange required once the retting process is complete is no problem (except perhaps for any dissolving pesticides used during farming).

The retting process is associated with a certain **odour nuisance** which cannot be avoided at reasonable cost. The only remedy is **not** to site these plants **close to residential areas** and to take account of prevailing wind directions.

Because fibre production is a low-input technology in every respect, negative environmental effects can only be avoided by selecting a suitable site and making use of what nature has provided.

2.2.9 Tanneries

Of all the agro-industries tanneries harbour the greatest **risk potential** for the environment. This is due on the one hand to the considerable **odour nuisance** and on the other to the **dyes** and other **chemicals** (particularly chromium compounds) used in the tanning process which complicate the wastewater treatment operation. And there is also biological pollution. Besides a substantial impairment of the quality of the nearby **surface waters**, an enrichment of the hazardous substances in the **soil**, and possibly also in the **groundwater** must also be expected.

The **elimination of odours** at source is only possible if the tanning is carried out in **enclosed rooms** and any air escaping is cleaned in technically sophisticated **filter systems**. The nuisance can be limited indirectly by **concentrating** plants of this kind **on sites a suitable distance from residential areas**. This would also create the conditions essential for the relatively complex process of **multistage wastewater treatment,** which is essential in this industry but which is really too costly for an individual small plant (see also the environmental guidelines of the World Bank).

2.3 Socio-economic impacts

The overwhelming majority of **jobs** in the agro-industry call for **little in the way of qualifications** and most workers are women. However, as mechanisation and machine-based jobs increase, the proportion of male workers rises - as do monotony and isolation of the individual working processes, and the risk of accidents. The extent to which the employment of women leads to changes in their own food production needs to be examined. The jobs are of poor quality in ergonomic terms, and nuisances in the form of **dust, damp, smells and noise** may attain levels which can affect the health of employees, constituting a considerable risk to women in particular. Because different types of jobs are done by the two sexes, **qualification and training programmes** must be established at an early stage, with the emphasis on female employment. These programmes should take account of the overall form of production and lifestyle of female employees and their families.

3. Notes on the analysis and evaluation of environmental impacts

The environmental impacts in the agro-industry can be assessed in terms of space, time and in relation to various resources and employees.

In the "agro-industry" sector assessments are based directly or indirectly on the following **test criteria**:

- impacts on employees in the factory
- impacts on people living near the factory
- environmental changes due to the emissions from the factory
- environmental changes caused indirectly by the factory (e.g. change in the quantity of water or extra energy required).

Short-, medium- and long-term impacts and likewise direct and indirect impacts must be considered in the light of these test criteria.

The **evaluation** involves comparing the project with other possible projects, and also considers the economic, ecological and social costs involved.

The evaluation of effects on health faces the problem of the frequent lack of national limits or recommended values for individual substances, and this is further complicated where a number of substances are emitted at the same time, thereby increasing their impact due to synergistic effects. One initial approach to this problem area may be provided by publications of international organisations such as the World Health Organisation (WHO) (see in this regard Volume III, Compendium of Environmental Standards.

4. Interaction with other sectors

There are close links with the **plant and animal production sector** which supplies the raw materials, and with the **marketing** sector, not forgetting the **metal** and **mechanical engineering industries** which manufacture the processing equipment, and the packaging materials industry.

Other factors in the equation are **veterinary services, livestock farming, irrigation** and **health and nutrition**. Projects in the field of the **economy** and also **infrastructural measures**, particularly in the **rural hydraulic engineering sector**, are significant issues in the assessment of agro-industrial projects, while cross-sectoral concepts of **general resource management, location planning and regional planning** must not be forgotten.

5. Summary assessment of environmental relevance

Agro-industries often serve as **pilot projects** for more general industrialisation, and must therefore be examined very closely in terms of their direct and indirect impacts on the **food supply and economic prospects of the country concerned**, its general environmental conditions, and the lives of its female population in particular.

Agro-industrial projects are extremely important to a country's independent development and this is closely allied to general subsistence production.

Direct environmental pollution from small and medium-sized agro-industrial factories on an individual level is relatively slight in the short-term, but the **more general effects** can be quite considerable.

One **exception** to this is **tanneries** because of the chemicals used -which are problematic in environmental terms - and the odour nuisance.

All factories which use water as the extraction, cleaning and transport medium produce **wastewater** which is biologically polluted to varying degrees, and this generally requires treatment in aeration ponds or treatment plants. Noise and dust emissions are normally **restricted in terms of the area affected**, and therefore affect primarily the employees themselves.

6. References

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