'how' and 'when' and 'where' rather than how much fish should be taken. This suggests management instruments such as territorial use rights, gear restrictions, and/or other rules that prescribe how the fish should be caught. It also suggests *adaptive* harvesting strategies that allow for switching between species when the decreasing catch per unit effort for one species indicates a relative decrease in its abundance, and it would be ecologically wise to switch to another species. This type of adaptation is impossible under a regime of assigning quantitative catch restrictions per species to individual fisherman.

If we look at fisheries management from a triple P perspective, it is clear that biological considerations have played a large role right from the start in management theory and practice: the Planet aspect dominates, Profit and People aspects are not explicitly considered. Economic considerations have gained importance in the second half of the last century, but there is a discrepancy between economic theory and economic practice. Economic theory suggests rather drastic management instruments in order to reach an economically optimal fishery; Planet and Profit theoretically go hand in hand, while People are not explicitly considered. Economic practice in turn leans heavily on social considerations, in terms of both pressure for higher returns now and accepting the risk of lower returns later; short-term Profit and People considerations prevail, at the expense of Planet and longer-term Profit and People considerations.

7.2 From erosion to flooding: land and water management in the Pantanal

In the 1970s, the government of Brazil decided to solve the problems of the poor and overpopulated southern states through an internal colonisation programme. In Planet-Profit-People terms, this was a People-Profit problem. The government founded the Instituto Nacional de Colonização e Reforma Agrária (INCRA), to lead the colonisation of the 'empty' northern states as far as Rondonia. The Planalto, the highlands around one of the planet's prime biodiversity areas, the Pantanal, were also colonised in this period. Until then, the Planalto had been mainly covered by natural vegetation. The Pantanal is sparsely inhabited by farmers, mainly living off large cattle-breeding farms (20,000-100,000 ha), and indigenous people. The farmers arrived here in the period of the Portuguese colonisation. In the present era of globalisation, their income is under threat due to rising costs and falling prices: they have to intensify and enlarge or seek alternative sources of income in eco-tourism and green labelling; in other words, they have Profit problems.

The soil of the Planalto is easily eroded and colonisation has taken place without adequate knowledge of the consequences for the rivers running west into the Pantanal. The new farming practice led to increased erosion, and rivers in the Pantanal (mainly the central Taquari river) have silted up, turning them into unstable braiding systems leading to economic and ecological problems. The silting up of the Rio Taquari is currently the major problem in the Pantanal and the Mato Grosso do

Sul, because of the nearly permanent inundation of an area of about 11,000 km^2 in the Paiaguás sub-region.

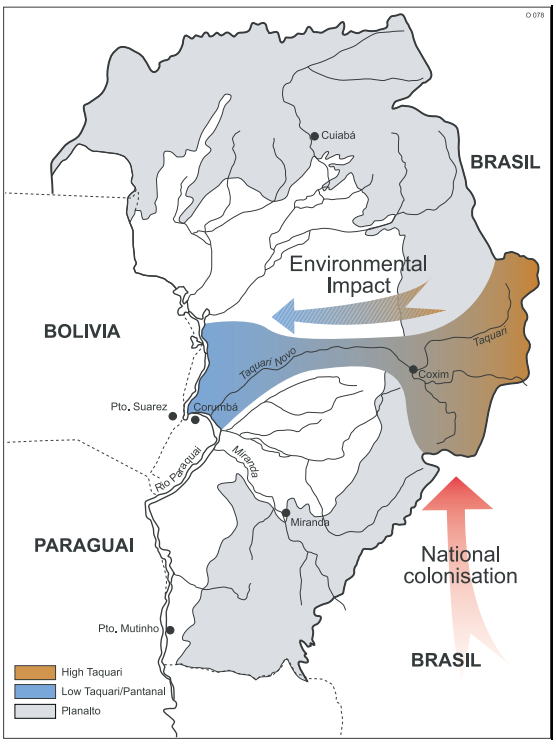

Figure 9. Spatial transference of environmental problems in the Pantanal

The solution for the economic problems of the poor farmers from the south of Brazil has been based on the economic knowledge that was available to INCRA in the 1970s. The problem of erosion and the environmental consequences for the Pantanal were not known, mainly because the focus was on colonisation of new land in a spatially different context than the regional ecological system. The farmers in the Planalto do have a problem, because they are losing their land. Another major problem, however, is not theirs, but occurs in the large downstream areas, which have no social and economic relationship with the Planalto.

Before the colonisation of the Planalto there was no need for the lowland farmers, municipalities and nature conservation agencies to interfere with the water and land management of the upper part of the catchment. Now, however, their livelihood and existence are under severe threat as a result of the entry of new inhabitants into the system. They are now in need of an institution that takes care of water and land management in the system and that will look after their interests, a need they share with the new colonisers and the eco-tourism industry. This means that economic and ecological problems have to be solved through management and knowledge of the system as a whole, which has led to the creation of a Commission of the Taquari.

The perspective for the future is that collaborative efforts to understand the system, identification of sensitive ecosystems within the basin, joint decision-making and

consistent management can solve the social and economic problems of the farmers in the Planalto and the Pantanal and can preserve the area's biodiversity. People have to create new institutions to balance the impact of Profit on Planet and aim for sustainable use. This case shows that even within one country, one jurisdiction, planning interventions and estimating their impacts does not automatically guarantee that all P domains are included. As a result, externalities create unforeseen problems. Existing institutions should be critically evaluated to avoid similar problems in the future.

7.3 From tapioca to manure: the pig production chain

In the Netherlands, pig production has changed from a backyard activity catering for home or local demand into a professional activity of specialists aiming at national and international markets. The division of labour leads to a production chain in which each professional actor adds value to the product before passing it on to the next actor in the chain (Figure 10).

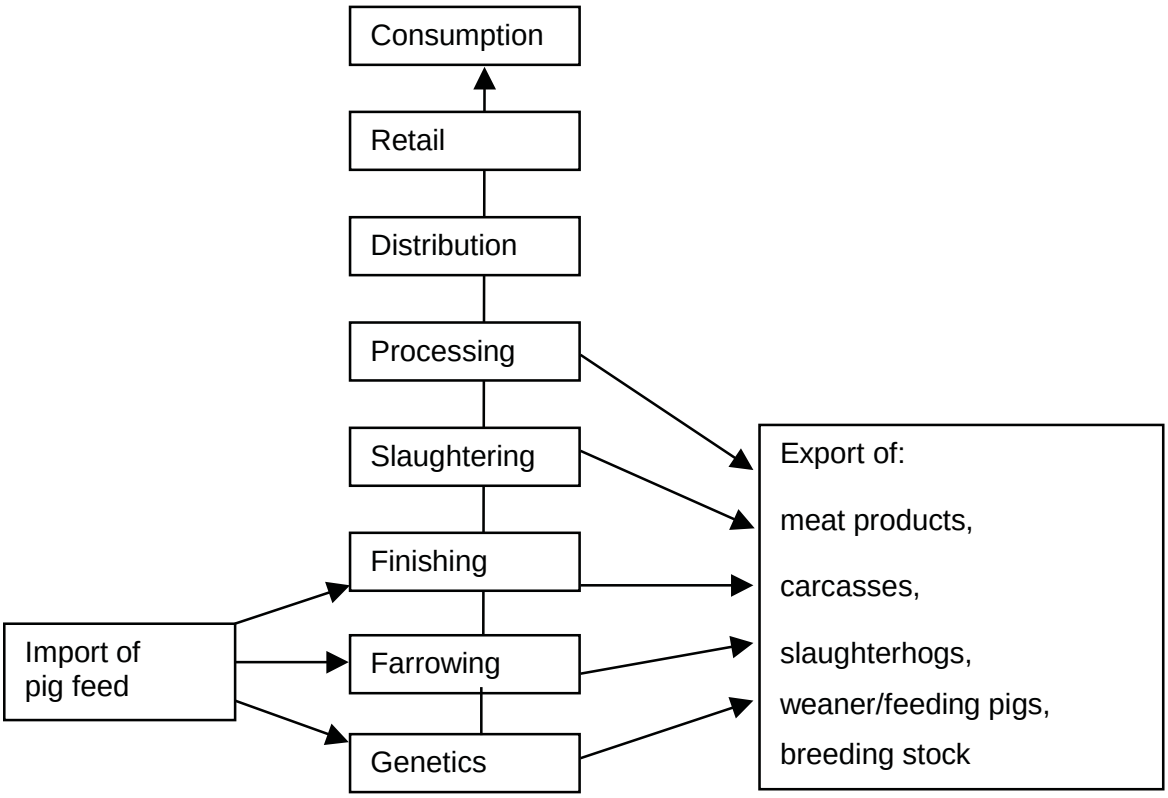

Figure 10. The Pig chain and its added economic values