

3. Agriculture

Against the backdrop of the contraction of business-sector product, the 1.9 percent rise in agricultural product in 2001 is noteworthy (Table 1.18). Agriculture accounted for some 2.5 percent of business-sector product in 2001. As the industry that supplies foodstuffs, a rise in its product represents primarily a response to the expansion of domestic demand in line with population growth.

The long-term trends that have characterized agriculture persisted in 2001. The increased dependence on cheap foreign labor continued, with a fall in the number and proportion of Israelis employed in agriculture and decline in that of Palestinians. The price of agricultural input continued to rise more steeply than that of agricultural output. The long-term growth rate of agricultural product is slightly higher than that of the population; in 1997–2001 the former rose by an annual average of 3.2 percent, while the latter grew by 2.5 percent. Domestic demand expanded in line with population

In view of the decline in business-sector product, the 1.9 percent rise in the product of agriculture is notable.

The increased dependence on cheap foreign labor persisted. Input prices continued to rise more steeply than output prices.

Table 1.18
Indicators of Agricultural Production, ^a 1987–2001

	Average				(annual rates of change, percent)							
	1987–90	1991–94	1995–97	1998–2001	1995	1996	1997	1998	1999	2000	2001	
Output												
Total output ^b	3.2	1.9	4.5	1.3	9.8	5.0	-1.0	2.7	-1.7	4.0	0.3	
Inputs ^c	0.2	1.5	1.4	-1.0	5.7	0.5	-1.9	-3.1	-0.1	0.5	-1.0	
Gross product	6.6	2.3	8.1	4.0	14.4	10.3	0.1	10.1	-3.4	8.0	1.9	
Total farm real income	-3.5	-0.4	-4.2	0.8	-4.5	-4.4	-3.8	17.1	-12.9	0.1	1.1	
Real income from capital and own labor		-4.1	-15.5	0.3	-15.1	-17.6	-13.8	39.2	-25.4	-3.2	0.9	
Factor inputs												
Labor	-4.6	4.0	4.5	-1.5	5.6	4.2	3.6	4.8	5.3	-1.1	-13.7	
Gross capital stock	-1.6	-3.6	-1.0	0.5	-2.6	-0.3	-0.2	-0.2	0.8	0.9	0.5	
Capital/labor ratio	3.2	-7.3	-5.3	2.0	-7.7	-4.4	-3.7	-4.8	-4.2	2.0	16.4	
Productivity												
Labor productivity	11.7	-1.7	3.4	5.6	8.3	5.8	-3.4	5.0	-8.2	9.3	18.1	
Total productivity	10.3	1.4	5.7	4.7	11.9	7.8	-2.0	7.1	-6.6	8.4	10.6	
Total exports												
Citrus	-4.6	-12.5	10.1	-13.5	36.4	-5.5	3.5	-13.7	-15.5	-21.4	-2.3	
Other	-1.6	11.9	17.4	2.9	20.3	22.7	9.8	12.6	5.1	0.5	-5.7	
Prices												
Output	11.0	8.1	4.6	1.8	1.2	7.3	5.5	5.5	2.1	-0.9	0.7	
Purchased imports	14.4	9.0	9.9	3.1	8.2	17.1	4.7	0.4	6.5	4.2	1.4	
'Terms of trade' ^d	-3.1	-0.8	-4.7	-1.2	-6.5	-8.3	0.8	5.1	-4.1	-4.8	-0.7	

^a See appendix tables for agriculture (1.A.1.28 - 1.A.1.31)

^b Including intermediate product.

^c Purchased and intermediate inputs.

^d Output/input ratio.

SOURCE: Based on Central Bureau of Statistics data.

growth and the rise in living standards. Because of administrative restrictions, agricultural imports continued to consist mainly of products not grown in Israel.³³ The share of agricultural exports in output has remained stable in the last few years.

Labor input in agriculture fell by 13.7 percent in 2001 and capital input rose by 0.5 percent, so that total factor productivity (TFP) went up by 10.6 percent. In the short run, agricultural productivity is subject to sharp changes, because of the effect of the weather, so that productivity cannot be measured in the short term. In 1998–2001 productivity rose at an annual rate of 4.6 percent. The price of output deflated by the Consumer Price Index (CPI) dipped slightly, and the price of input rose slightly, largely due to the higher price of water for agriculture. These trends reflect the long-term deterioration of agriculture's 'terms of trade,' i.e., the relation between output and input price indices. Real total income from agriculture rose by about one percent, and its division between payment of wages and real income from own labor and capital is similar to that in 2000. However, the continued trend of substitution between self-employed farmers, who are leaving the industry, and wage-earning employees (whose wages were unchanged in real terms in 2001) markedly increased the income of self-employed farmers (excluding compensation payments), by an average of 29 percent.

The decline in labor input in agriculture accelerated in 2001,³⁴ and the change in the composition of employment continued. Because of the security situation the number of Palestinian workers contracted from 10,000 in 2000 to 1,300 in 2001, when they constituted only 1.9 percent of farm employees, compared with an annual average of 13 percent in 1998–2000. Some of the Palestinian workers were replaced by foreign workers, whose number rose by 4.2 percent to 32,000. The industry's dependence on foreign workers is therefore increasing, and their share has risen from 35 percent of total employment in 1999 to 37.5 percent in 2000 and 45 percent in 2001 (Figure 1.25). At the beginning of 2002 the government authorized an additional 6,000 permits for foreign workers for agriculture.

In the past the farm industry was characterized *inter alia* by the small share of wage-earners and wages in its income; this feature has been gradually disappearing over the last decade in view of the structural and social changes occurring in agricultural settlements, particularly since 1995. After declining in 1992–98, however, the share of wages in total agricultural income has remained stable at 60 percent since then. If the labor input of self-employed farmers in total income from farm labor is included, we find that the average return on capital in the industry is negative. This explains why self-employed farmers are leaving the industry and there is a growing tendency to use

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The income of self-employed farmers rose by 29 percent on average in 2001.

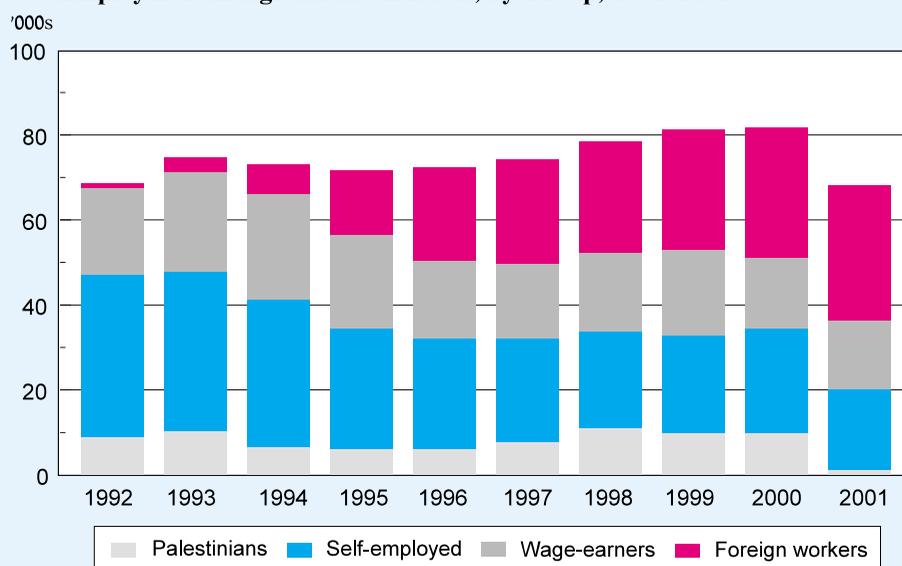
The industry's dependence on foreign workers is growing, and they constituted 35 percent of total employees in 1999, 37.5 percent in 2000, and 45 percent in 2001.

Self-employed farmers are leaving the industry because the return on capital is negative on average.

³³ Except for imports from the Palestinian Autonomy, which consist primarily of vegetables but account for a very small share of imports.

³⁴ For the purposes of this section, the data for 1995 and subsequently on employment and labor input in agriculture from the CBS have been brought into line with the definition of the agriculture industry there: data on gardening workers, which are included in it in accordance with the Labor Force Survey definitions, have been deducted.

Figure 1.25
Employment in Agriculture in Israel, by Group, 1992–2001



SOURCE: Based on Central Bureau of Statistics data.

cheap hired labor—processes that are apparently unavoidable given the current state of the market. The fall in the number of self-employed farmers would be steeper if there were better alternative employment possibilities in Israel, especially in rural areas, and institutional provisions that were better suited to worker mobility (pension arrangements, vocational retraining, etc.). The policy of making farming land available for alternative uses and of reducing water quotas or raising the cost of water could also accelerate the process.

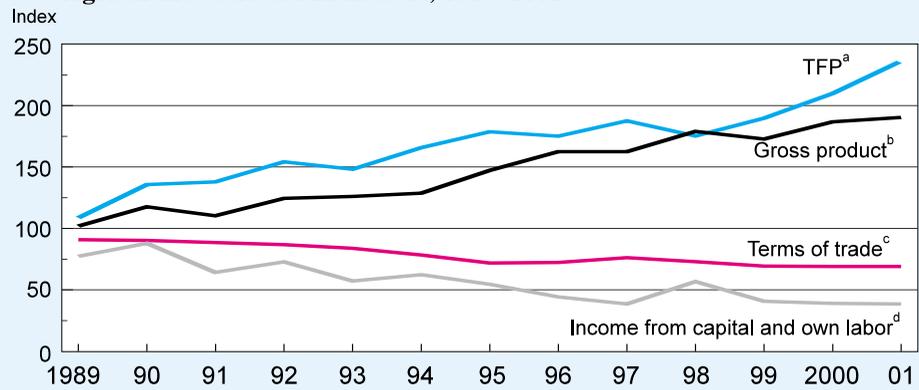
Although a discussion of the agricultural developments of a single year is of limited significance because of the industry's unique character, note that in 2001 total agricultural output remained stable; the output of field crops—some 54 percent of total output—contracted by 1.6 percent, while that of livestock rose by 2.6 percent. The decline in output appears also to have been partly due to the real rise in the cost of inputs in field crops—especially water—which went up by 9.4 percent in nominal terms, further to their average annual 5.65 percent rise in 1999 and 2000. The increased cost of water is leading to a gradual switch to the use of recycled or brackish water and to crops that need less water.

Production for export constituted 19 percent of agricultural output in 2001, representing a 2.4 percent increase over 2000. Production of cotton for export rose by 65 percent in 2001, while that of citrus fell by 12 percent, continuing the long-term trends (Tables 1.A.1.29 and 1.A.1.30). Most agricultural exports (about 91 percent) are of field crops. Exports of vegetables, whose share of agricultural exports is growing, were up by 25 percent in 2001, continuing the trend evident since 1998. This is due to the availability of foreign workers as well as to specialization in exports of organic vegetables (see Box 1.7).

The rise in the real cost of water appears to have contributed to the reduced output of field crops.

Production of vegetables for export rose by 25 percent in 2001, continuing the trend evident since 1998. This is due to the availability of foreign workers.

Figure 1.26
Agriculture: Selected Indicators, 1989–2001



^a Total factor productivity.
^b Gross agricultural product, at constant prices.
^c Output/input price ratio.
^d Excluding compensation and subsidies, deflated by the CPI.
 SOURCE: Based on Central Bureau of Statistics data.

Box 1.7 Organic Farming

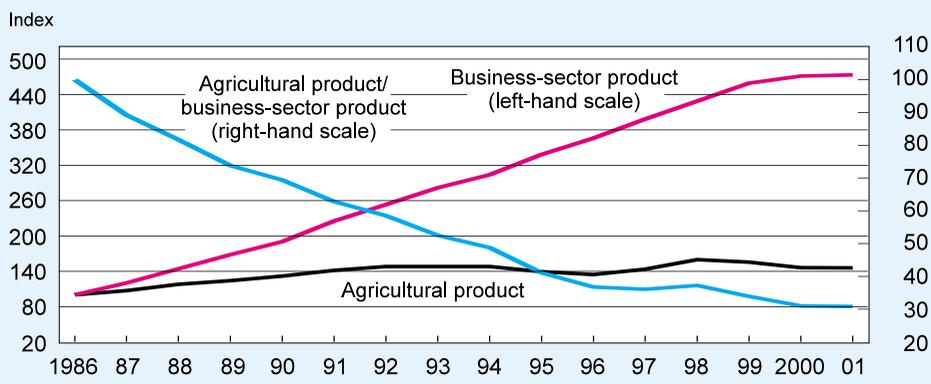
Organic farming is growing apace, in contrast with conventional farming, which has been marking time for several years. In 1998–2001, when total agricultural output hardly rose at all, the output of organic farming increased by 30–40 percent a year, and the forecast is for continued growth in the future. The value of organic farming output in 2001 was NIS 210 million, about 70 percent of it in exports, compared with 19 percent in agriculture as a whole.

Organic farming has several advantages over conventional agriculture, the first being environmental—it does not pollute the ground or water sources. In addition, the return on organic farming is higher than on conventional agriculture, as the price difference between organic and conventional farming produce ranges from 30 to 100 percent. Israel’s export potential in this special field is very large because of the considerable demand abroad and lack of supply, especially in winter and spring, when Israel enjoys a comparative advantage. Consequently, exports of organic farm produce have risen consistently, and in 2001 sales amounted to NIS 140 million.

Organic farming is based on consumers’ trust and reliability of supply, as well as on constantly improving quality control, reliability, and transparency. The trust of consumers is expressed in the confidence that a product marked as such is in fact organic, and that the product sold is a natural one which meets international standards. Supervision is currently conducted by an independent company set up by the organic farming association and a nonprofit institution of

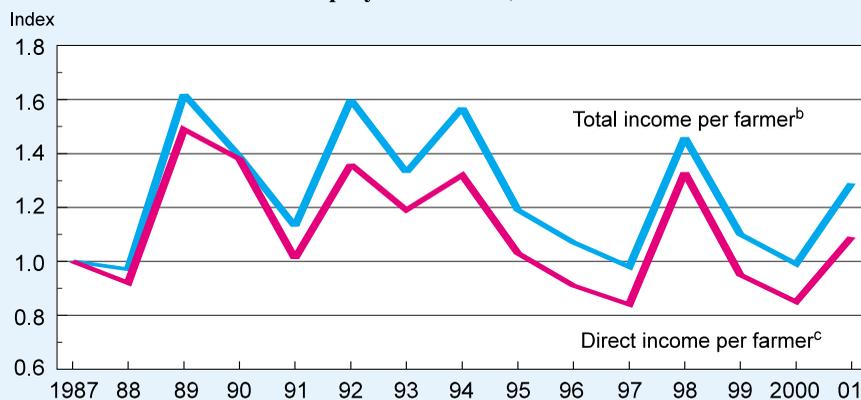
organic consumers. Produce for export and for domestic consumption is supervised, but this applies solely to the production process and the large retail outlets. Most stores are not under supervision. The Supervision of Organic Produce Law, which is currently being processed by the Economics Committee of the Knesset (it has had its initial reading), will ensure that no non-organic produce is marked as organic.

Figure 1.27
Indices of Agriculture and Business-Sector Product Prices, 1986–2001



SOURCE: Based on Central Bureau of Statistics data.

Figure 1.28
Real Income of Self-Employed Farmers,^a 1987–2001



^a Index of real income, 1=1987.

^b Including compensation and subsidies.

^c Excluding compensation and subsidies.

SOURCE: Based on Central Bureau of Statistics data.

Gross capital stock in agriculture remained stable.

In the last three years gross capital stock in agriculture has grown at a moderate rate of less than one percent a year (as gross investment came abreast of annual discards, the ‘consumption of capital’ that has characterized the industry since 1986 was checked). At the beginning of 2001 gross capital stock returned to its level in the mid-1990s.

Subsidies for agricultural output,³⁵ i.e., open and direct subsidies and transfer payments, rose by 58 percent in 2001 to stand at about 3.9 percent of the value of output.³⁶ Subsidization of the price of water for agriculture soared in 2001, to reach NIS 333 million, compared with NIS 129 million in 2000. This increase derived *inter alia* from the compensation paid to farmers for the reduction of water quotas. The overall level of the other subsidies (on eggs, hens, etc.) was similar in 2001 to that of 2000. Note that in the OECD countries the subsidies to farmers, particularly ‘green subsidies,’³⁷ are even higher.

Box 1.8 Water Policy

Israel’s water system is in deep crisis because water consumption exceeds supply by far. Because of the gap between supply and demand, which began to emerge in the early 1990s, the accumulated deficit reached cu. m. 2.5 billion fresh water. The supply of fresh water in an average year is cu. m. 1.55 billion, while the demand for fresh water from all sources—households, manufacturing, agriculture, the Palestinian Authority, and transfer of water to Jordan—is cu. m. 1.785 billion a year. Agriculture consumes about cu. m. 880 million of this and households cu. m. 720 million, so that the annual average deficit is cu. m. 235 million. Lake Tiberias and the underground aquifers constitute a stabilizing element: water accumulates in them in rainy years, and is pumped from them in a drought, so that the supply of water in dry years is similar to that of rainy ones.

The crisis in the water system is expressed in the low water-levels of the reservoirs and the deterioration in the quality of the water—salinity and pollution. If the present water policy continues and the population—Israeli, Palestinian, and in the rest of the region—grows as expected, the situation will be aggravated.

In determining Israel’s water policy it is necessary to take the situation in the region into account. Water is in short supply because demand for it is increasing due to the rapid population growth in the region and rise in the standard of living in Israel, whereas there is virtually no increase in supply. The allocation of water is a bone of contention between Israel and its neighbors, so that when

³⁵ Based solely on preliminary data; the subsidies may be larger.

³⁶ Excluding the subsidy of capital costs for the share of agriculture in the water system, and the subsidy implicit in protection of domestic produce from foreign competition, a component that has shrunk on the margin in recent years. In the context of exposure to imports, note that under the Paris Accords with the Palestinians, all the volume restrictions on imports of agricultural produce from the Palestinian Autonomy were annulled as of January 1998.

³⁷ Neither for production nor for export.

it comes to allocating and developing water sources the considerations cannot be solely economic; security and political factors must also be included. In accordance with the peace agreement between Israel and Jordan (signed in 1994), Israel transfers to Jordan some cu. m. 55 million a year. Under a joint agreement to develop water sources, new sources of water representing cu. m. 100 million will be developed, and the water piped to Jordan, which is suffering from a severe shortage. The Palestinians also have demands, and in order to give them force the Palestinian Authority is adopting a strategy of preserving the current inefficient system and increasing its demands on Israel. Among the possible considerations are the creation of interdependence between the entities: cheap water supplied by Israel to Jordan and the Palestinians can stimulate agriculture there and create relative specialization in that industry, while Israel continues to specialize in industries in which it has a comparative advantage.

Current water policy leads to the incorrect distribution of water uses among agriculture, households, and manufacturing; the price of water for agricultural use—NIS 0.808 per cu. m.—is subsidized, and hence below the marginal cost of pumping and piping it, which is NIS 1.4 per cu. m. Subsidization of the price of water for agriculture was approximately NIS 300 million. This does not take into account the damage to the aquifers resulting from over-pumping. In determining the price of water for agriculture, the externalities of agriculture must also be considered. The positive externalities are the employment of 35,000 Israelis, the development of agricultural settlements, population dispersal enabling control over land to be retained, and self-sufficiency in food. The negative externalities include environmental pollution resulting from the use of fertilizers and pesticides. The amount of water allocated to agriculture is limited by quotas, and these are distributed on an historical basis rather than economic efficiency.

Farmers use both fresh water and recycled effluent. The extent to which recycled water is used is currently cu. m. 270 million, though its potential supply for agriculture, if new recycling projects are developed,¹ is cu. m. 320 million. Some of the recycled water goes to the sea, as the difference in price paid by farmers for clean and recycled water does not always justify laying pipelines for the latter from the purification plants to the farmers. The Ministry of Finance is constantly trying to raise the price of fresh water relative to that of recycled water for agriculture so that it will be more worthwhile for farmers to use recycled water. Although it is advisable to impose the cost of piping recycled water on farmers, the cost of recycling it should be borne by the polluters, i.e., municipalities and/or factories.²

¹ It is expected to take about four years to set up these projects.

² To be more precise, the polluter should bear the cost of bringing the water to a state where it is not detrimental to the environment, while the farmer should bear the cost of piping from the stage of recycling that is appropriate for his needs, which may be lower than that required from the polluter.

Ways of Increasing the Water Supply

Method	Price per cu. m. ^(a)	Quality	Potential amount	Comments
Purification	55 cents	Fresh	Unlimited	Calculated on the basis of a large plant purifying cu. m. 50 million a year. Two plants are being built, in Ashkelon and Ashdod, and together will provide 95 million cu. m. a year from 2003. Another three plants will together provide cu. m. 65 million a year in 2004.
Development of marginal water sources (runoff)	55 cents	Fresh	cu. m. 30 million a year	
Unutilized potential of <i>fresh water</i>		Fresh	There is no unutilized potential. A reduction is expected due to urbanization and pollution of sources	Water in the eastern reservoirs has been promised to the Palestinians.
Brackish water	30-35 cents	Brackish/ fresh	cu. m. 55 million a year	By desalinating brackish water or using brackish water in farming for certain crops. Another cu. m. 50 million can be upgraded at a cost that is higher than desalination; cu. m. 100 million of fresh water will have to be treated in the future due to salination.
Effluent	27 cents	Effluent of v a r y i n g quality	cu. m. 170 million a year above current utilization, in 2010	Expansion by means of new plants, increasing capacity of and improving existing plants; cu. m. 50 million can be set up in 4 years.
Imported water	80 cents	Fresh	cu. m. 100 million a year	The infrastructure for absorbing imported water has been set up.
Reducing water loss in urban systems		Fresh	cu. m. 40 million a year	Reducing the loss from an average of 10 percent to 4 percent.

^(a)This price includes the investment and piping to the National Water Carrier.

The price of water for household use is NIS 3.46 per cu. m. The *Mekorot* Company, which supplies water to local authorities, sells it to them at NIS 1.42 per cu. m., similar to the price for manufacturing. The difference between the price for household use and that at which it is sold to local authorities constitutes the latter's profit, so that the authorities have an incentive to increase household consumption of water.

In the past, the Ministry of Finance chose not to invest in increasing the supply of water until its price for agriculture was raised. Now, because of the damage to the aquifers due to continued over-pumping, and in view of forecasts, supply-side solutions are also being considered. Below we distinguish between short-term and long-term solutions.

The solutions proposed in order to balance supply and demand involve raising the price of fresh water for agriculture in the short and long terms, and in the short term only—importing water. The long-term solutions are increasing the supply of water by desalination, developing marginal sources of water—runoff and brackish water—recycling effluent for agriculture, and curtailing water-loss by improving the management of water-pumping by local authorities.

An examination of the possibilities shows that the optimal solution as far as the water system is concerned is to increase the price of water for agriculture. Experts, and economists³ in particular, agree today that the price of water for agriculture should reflect its marginal cost, taking the externalities of agriculture into account. Raising the price of water for farmers from 18 cents per cu. m.—its current price—to 30 cents per cu. m. (the price for manufacturing) will, given demand elasticity of between -0.5 and -0.8 , reduce the consumption of fresh water by 30 percent.⁴ As a result, agriculture will contract and/or switch to crops that require less water, but that price will impel farmers to invest in pipelines that will bring recycled effluent to their fields. Concurrent with the increase in the price of water, the quotas should be abolished (while compensating farmers), and imports of agricultural products that consume large amounts of water should be permitted. In this way the country will have surplus water, at least in the next few years, and it will be possible to replenish the aquifers. If it is impossible for political reasons to raise the price of water for agriculture, importing water in the short term should be considered, in order to minimize the damage to the aquifers. The infrastructure for absorbing imported water is already in place. The cost of importing water is too high—70–80 cents per cu. m.—so that this is not a long-term solution. It is necessary to change the arrangement whereby it is in the interests of the local authorities to increase household water consumption.

³ Zvi Eckstein (2001), "Is Water Desalination Necessary?" in Avraham Tal (ed.), *The Water System, Studies and Opinions*, (Tel Aviv, The Interdisciplinary Center for Technological Analysis and Forecasting, Tel Aviv University); see also the reference to the work of Yoav Kislev, Yitzhak Ravid, and Menashe Davidson (2001), in Arnon Sofer, "Mapping Interest Groups in Israel's Water Policy," in Barry Rubin (ed.), *Efficient Use of Limited Sources of Water*, Bar Ilan University.

⁴ Zvi Eckstein (2001), see previous note.

With regard to increasing supply in the long run, to date tenders have been issued for the desalination of some 160 million cu. m. a year. The price per cu. m., including bringing the water to the national water-carrier, is at least 55 cents. This does not include the negative effects on the environment of desalination—air pollution and the destruction of the sea-coast—which is far higher than the current marginal cost of fresh water (also irrespective of environmental effects): some 30 cents. If there is any economic justification for desalination, it exists only when a wide range of considerations—the marginal cost of pumping water and transporting it, and the negative and positive externalities of agriculture vis-à-vis those of desalination—is taken into account. Note, however, that desalination has a political and security advantage: the existence of joint desalination plants with Jordan and/or the Palestinians will mean that Israel has common interests with them. The cost of recycling effluent is relatively low, some 27 cents per cu. m. Projects involving 50 million cu. m. can be established within a relatively short time, about four years, but are not implemented because of disputes between the Ministry of Finance and the *Mekorot* Water Company.

4. Transport and communications

The growth of the industry was checked in 2001, after several years of rapid expansion.

After expanding by an annual average rate of 5 percent in the last three years, in 2001 this industry did not grow at all (Table 1.19). Because labor input dipped by about one percent, labor productivity rose by the same amount. The wages paid by the industry rose by 5 percent, however, as was the case in the entire business sector, serving to reduce its profitability. Prices in the industry remained unchanged, in line with those of the business sector as a whole. Investment in transport and communications rose by 8 percent, mainly due to the marked increase in investment in the transport infrastructure, although it is still far below the desired level.

The importance of the industry is greater than is reflected by its share in business-sector product.

The industry's share of business-sector product continued to rise, reaching 12 percent, because it was less adversely affected than other industries, but the importance of the industry is greater than is reflected by its share of business-sector product. This is because it is an infrastructure industry with externalities, and the services of a large part of its capital—roads—are included not only in the product of transport but also in that of the industries that use them. Private vehicle services, which use its capital, are not included in business-sector product either. The industry is crucially important for the quality of life, as well as facilitating the economic and social integration of the various parts of the country. The transport and communications industry is capital-intensive; relative to the business sector as a whole, capital per worker was 4.5 times higher, product per worker 80 percent greater, and the average wage 30 percent more.