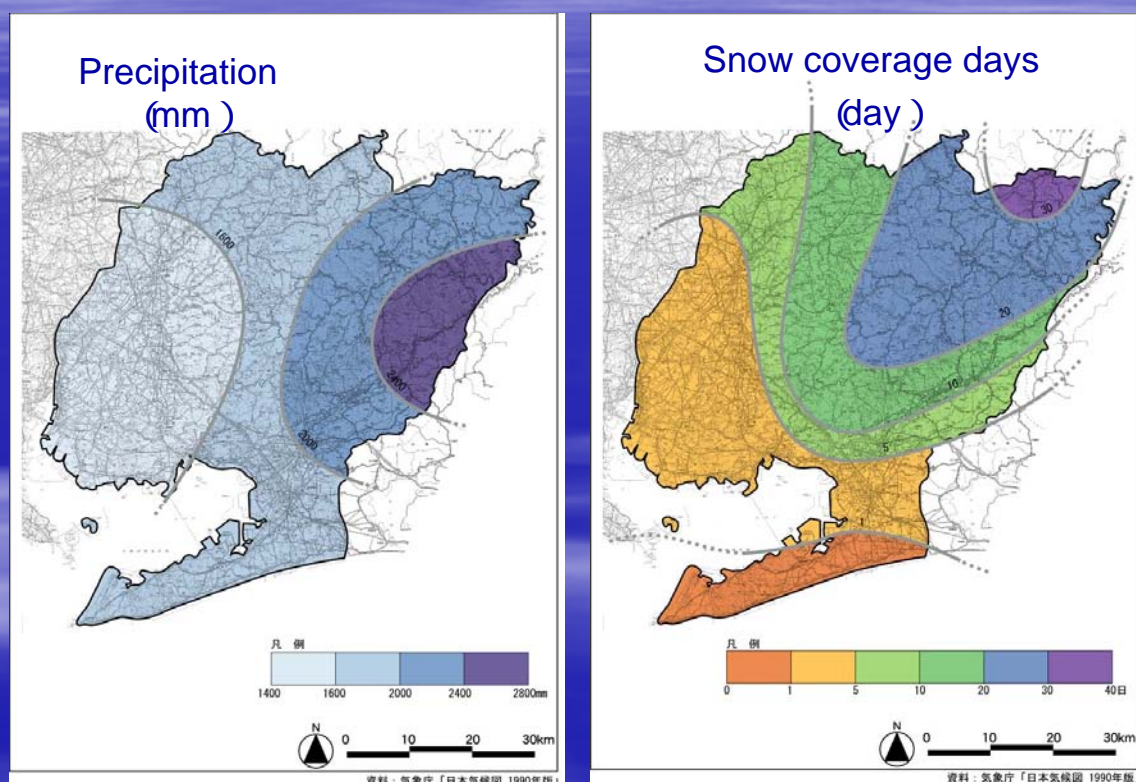


## Precipitation of Toyogawa region

- Precipitation of Toyogawa region



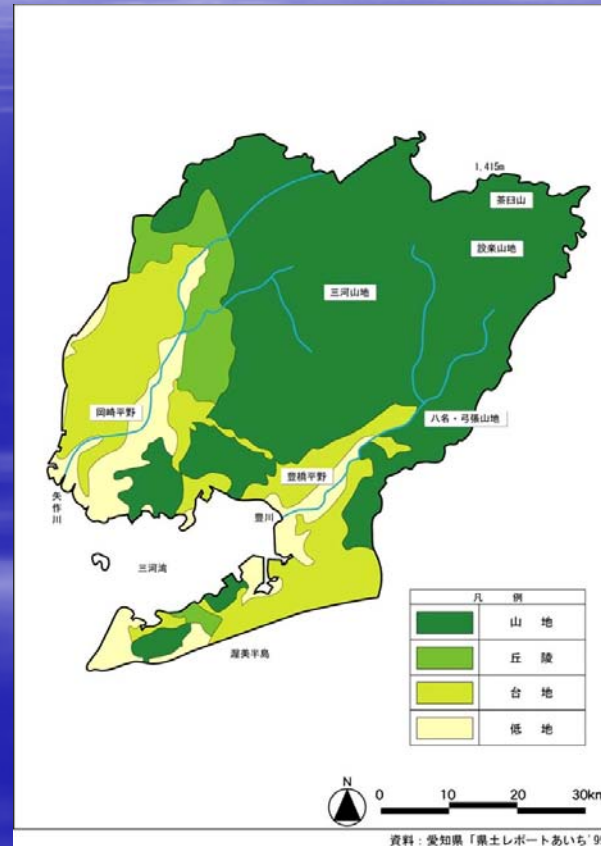
Fundamental conditions

## Geographical feature of Toyogawa region(1)

- Mountains area in Northern part
- Diluvium ground spreads out from the mountains area to Atsumi peninsula
- River Delta spreads out in Toyogawa mouth



- Developed as great agricultural area with the benefit by Toyogawa canal

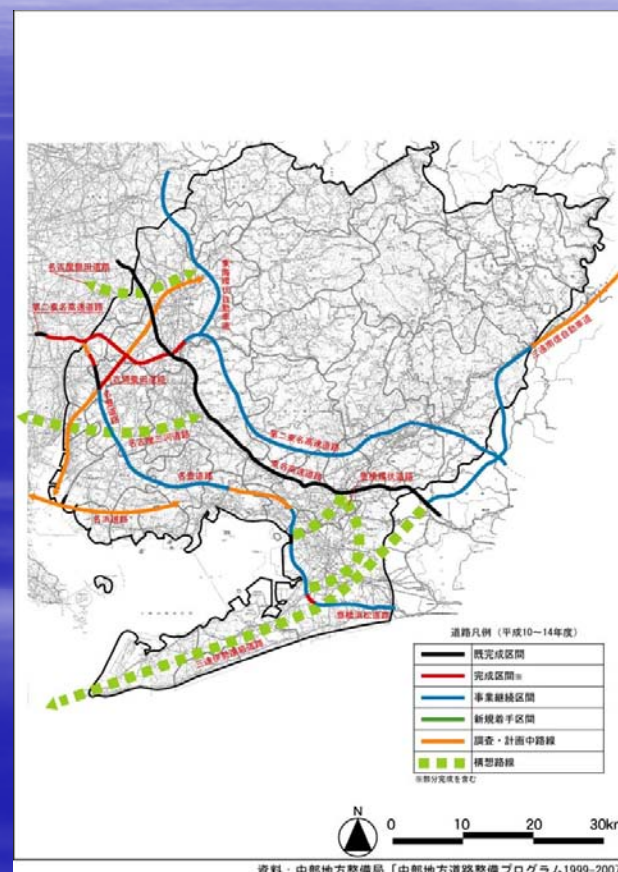


## Geographical feature of Toyogawa region(2)

- Located in the middle part of Japan
- Development of transportation network



- Good access to metropolitan market area (Tokyo, Nagoya, Osaka etc)





# Feature of Toyogawa

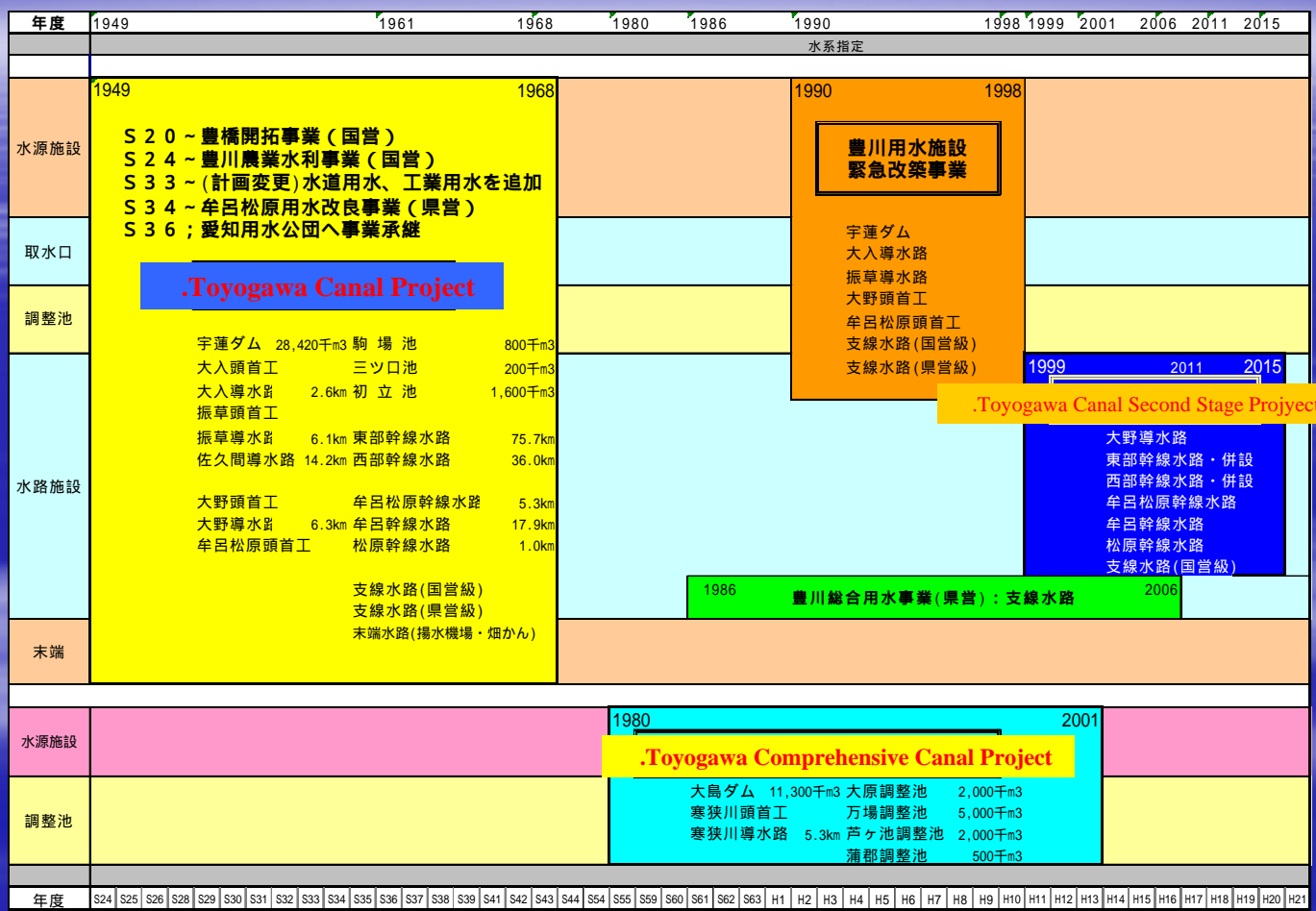
## Outline of main rivers

Name of river	Length of river (km)	River basin area (km <sup>2</sup> )	Maximum water quantity (m <sup>3</sup> /s)	Minimum water quantity (m <sup>3</sup> /s)	Annual average of water Q (m <sup>3</sup> /s)	River coefficient
Tone	322	15,760	7,535	6.5	231	1,153
Sinano	369	122,60	5,996	29.9	515	200
Tenryu	216	4,890	6,673	6.5	259	1,012
<b>Toyogawa</b>	<b>77</b>	<b>720</b>	<b>3,633</b>	<b>0.4</b>	<b>32</b>	<b>8,073</b>
kiso	232	5,275	8,883	48.9	345	181
Chikugo	194	3,700	8,909	10.7	154	828
Yoshino	141	2,850	4,430	20.5	170	216

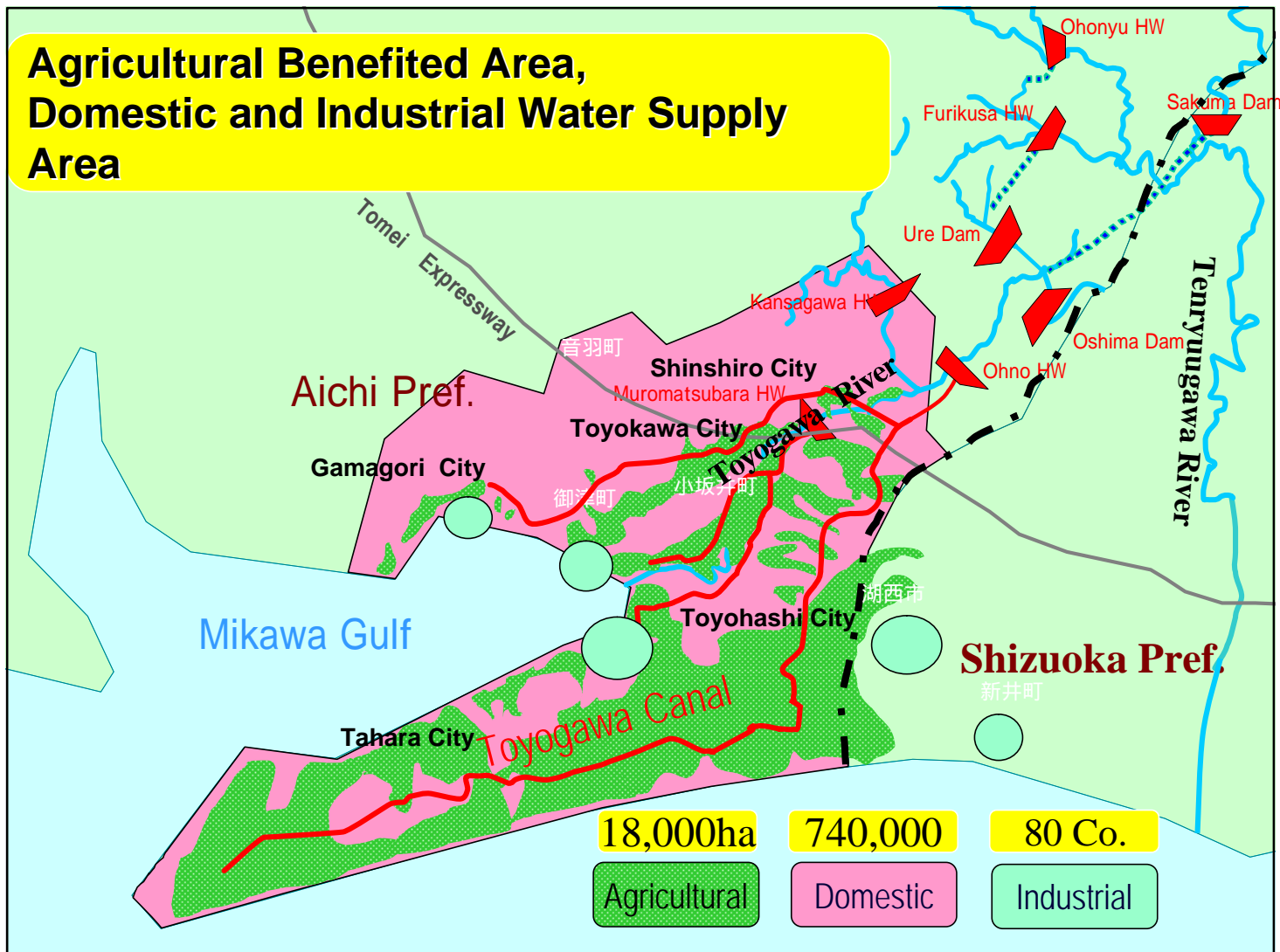
- The greatest river in East Mikawa
- Length of Toyogawa: 77km, River basin area: 720km<sup>2</sup>
- Annual average of water quantity: 32m<sup>3</sup>/s
- River coefficient: 8,073
- River slope is steep
- Deviation of water flows is large ( A lot of rain term & Few rainy season )

**It is important to control river flow in order to prevent flood and raise the irrigation effect.**

# Flow of projects regarding Toyogawa canal







## . Toyogawa Canal Project

Ure Dam (Effective Storage 28million m<sup>3</sup>)

流域変更施設 (Ohnyu HW, Ohnyu Tunnel, Furikusa HW, Furikusa Tunnel, Sakuma Headrace)

Ohno Headworks

Eastern Main Canal (Length 75.7km), Western Main Canal (Length 36.0km)

Muro-matsubara Headworks

Muro-matsubara Main Canal (Length 5.3km), Muro Main Canal(16.7km), Matsubara Main Canal (Length 10.0km)

Regulatin pond (Mitsukuchi-ike (200thousand m<sup>3</sup>),

Hattach-ike (1.6million m<sup>3</sup>), Komanba-ike (800thousand m<sup>3</sup>)





Ure Dam



Ohno Headworks



To-zai Diversion



Futagawa check

## Why the Toyogawa Canal Project was planed?(1)

### Agriculture

#### Before the Project

Climate is warm and good for agriculture.



Because of water shortage, only single cropping in the paddy field is possible in summer. Upland field is also cultivated but productivity was low.



Fig.1 用水通水前の農作業風景

#### After the project

Productivity of rice production and reached to the average of Aichi Prefecture.

Land productivity and labor productivity increased with enough water.

Production of upland crop has been increasing remarkably by the stable water supply.



## Why the Toyogawa Canal Project was planed?(2)

### Industrial Water

#### Before the Project

Good traffic  
conditon

Vast plane

Locate at the  
center of  
Japan

Good port

Because of these good conditions, this area had been expected to be developed, especially after the World War (1945)

However, it was impossible to develop industry.

#### After the project

#### Completion of project

(Volume of used industrial water)

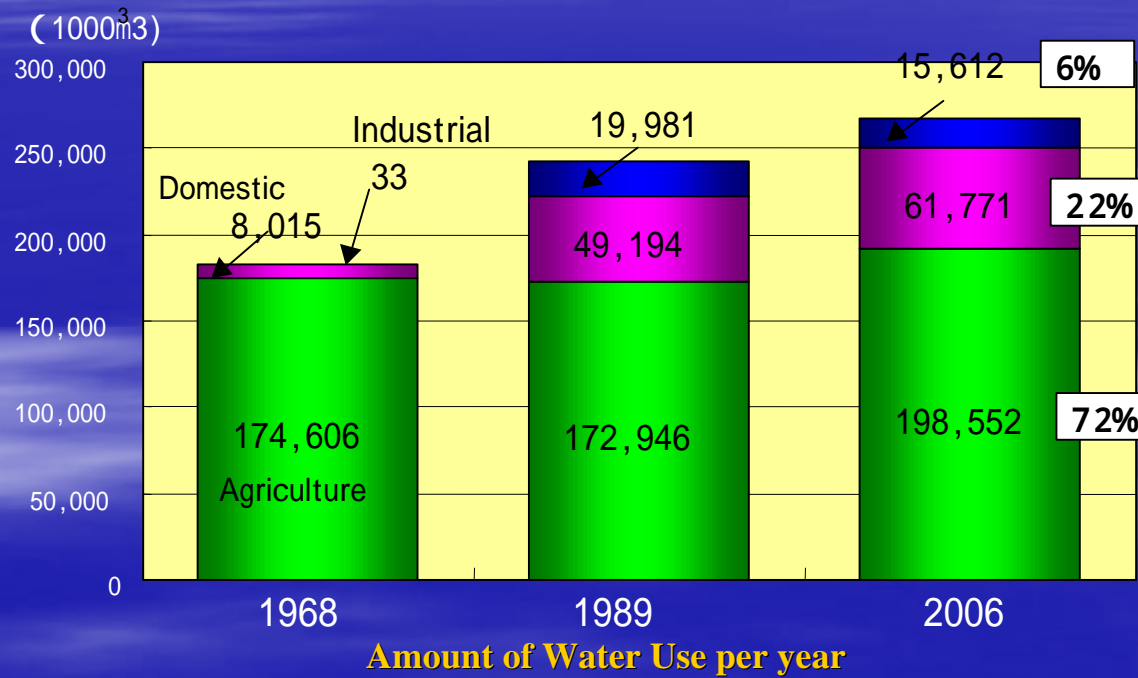
(Number of factories)

	1968	1973	ratio	1968	1973	ratio
	m3	m3	%			%
Toyogawa Area	46,598	179,734	386	95	109	115
Gamagori Area	17,242	25,096	146	113	100	88
Toyohasi Area	215,982	475,511	220	224	219	98
Atsumi Area	14,351	714,784	48	19	25	132



## Achievement and changes of water supply

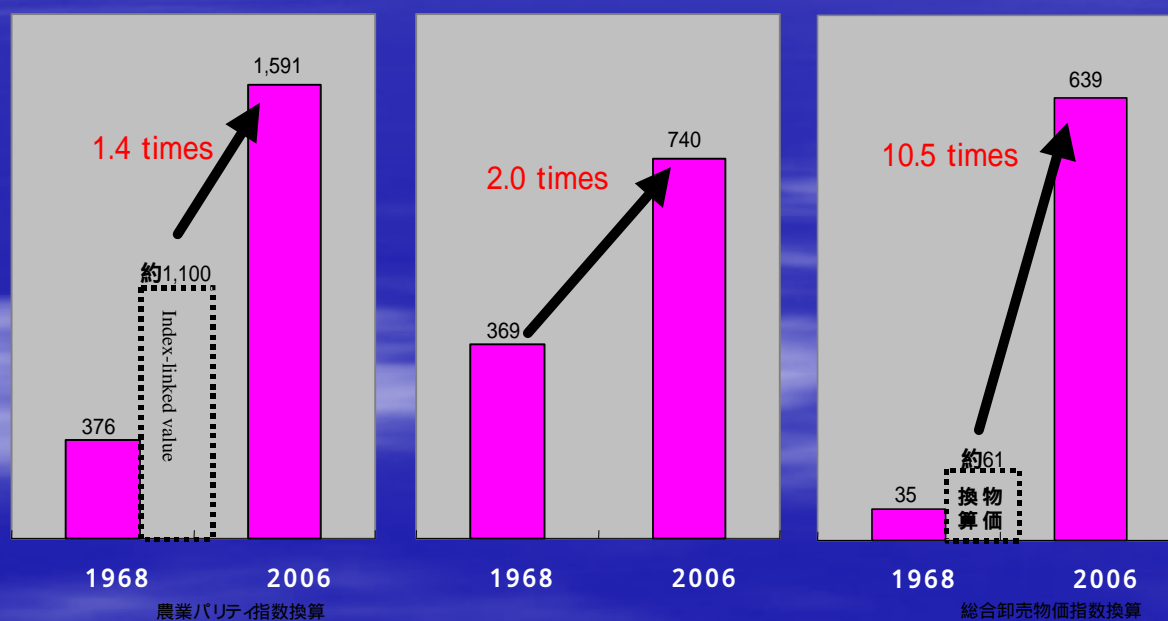
- Total amount of supplied water since 1968 is 9 billion m<sup>3</sup>
- Amount of Domestic and Industrial water increases keenly, and
- Amount of Agricultural water increases slightly.



## Effect of the Project

- Contribution to developing regional economy including agriculture by the Toyogawa Canal Project

Agricultural production (100million yen) Domestic water supply (1000 persons) Industrial production(100million yen)





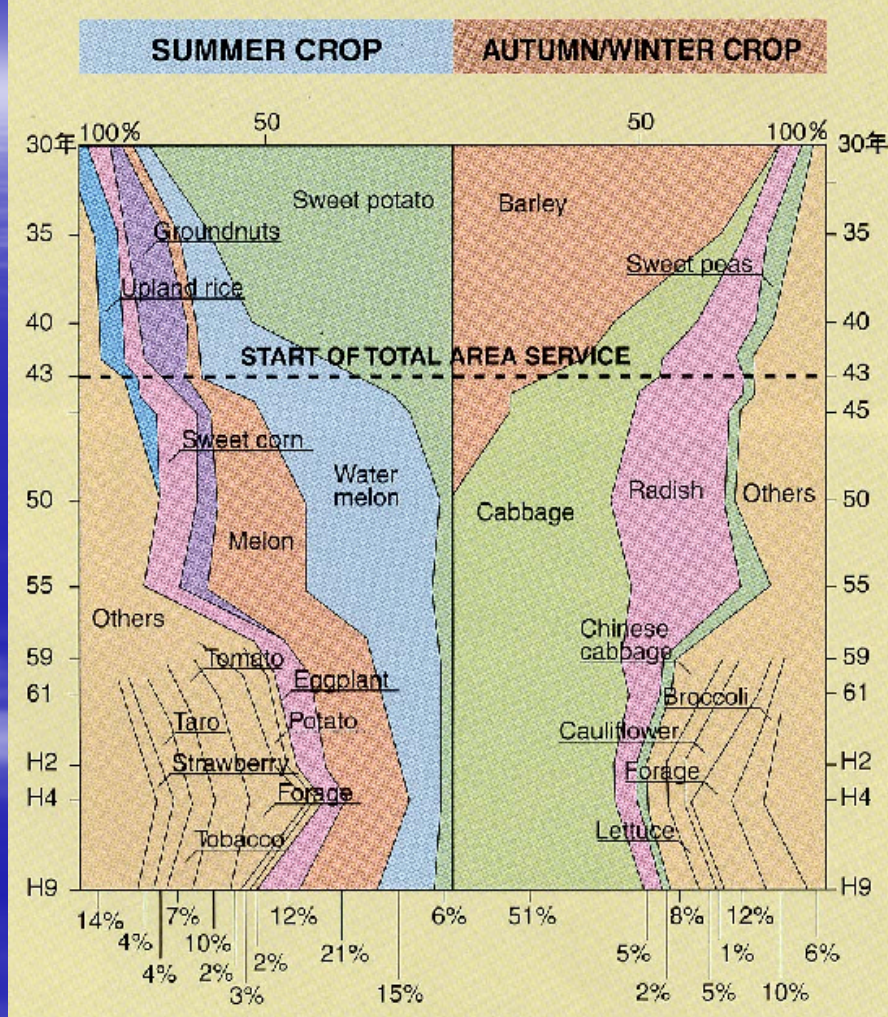
**Change of Cropping**

Cereal Crop (Wheat),  
Sweet Potato



Cash Crop  
(Vegetable, fruit)

**SHARE OF CROPPED AREA IN OPEN FIELD**



**Status of agricultural product**

市町村別農業産出額順位 (県内 国内上位)		(Unit: million yen)	
City/Town	Agri.Production	Ranking /prefecture	Ranking /national
Toyohashi City	47,380	2 位	2 位
Tahara City	72,440	1 位	1 位
Toyokawa City	13,680	3 位	50 位 以下
Gamagori City	7,510	10 位	50 位 以下

( Statistics in 2006 )



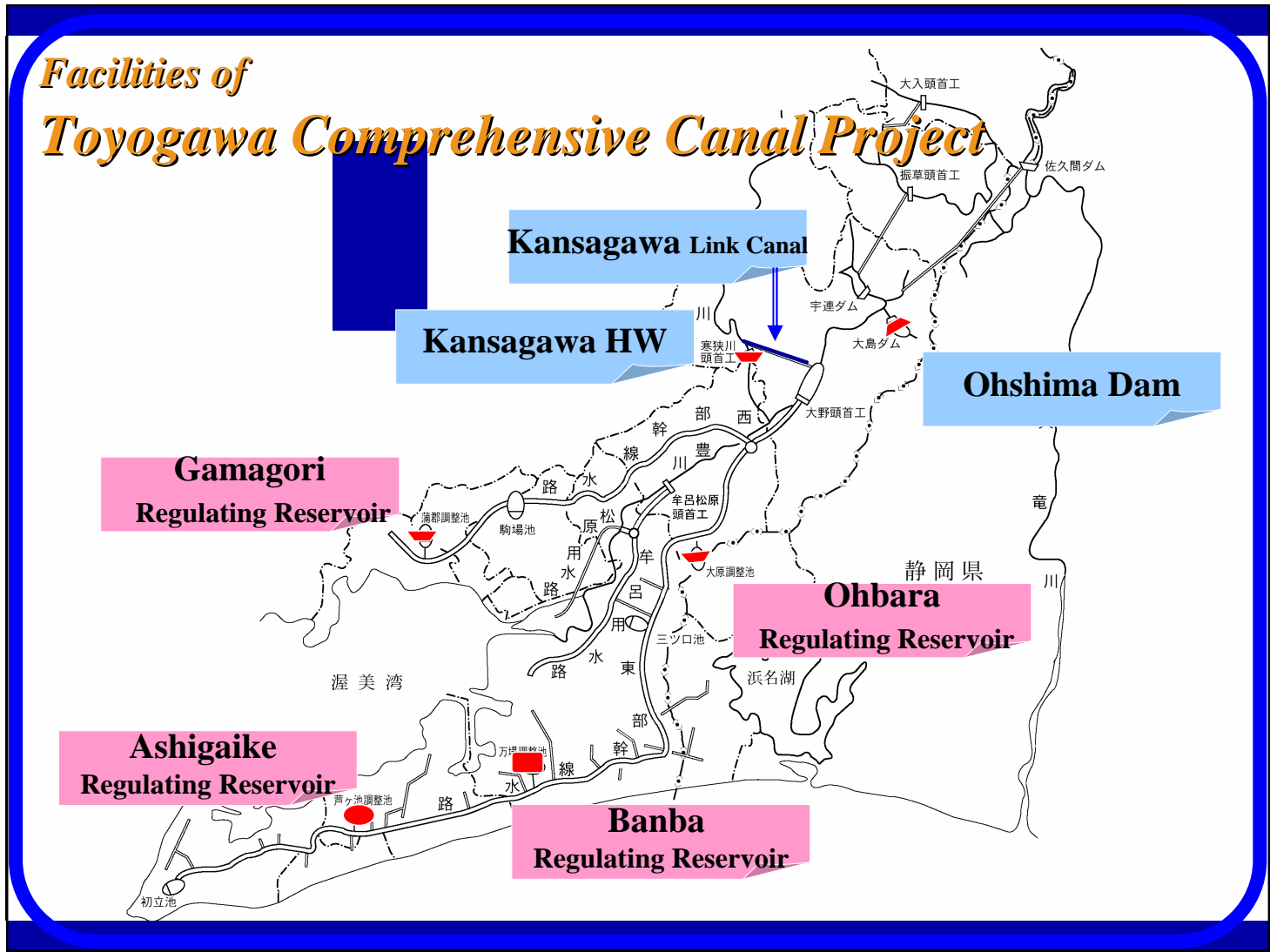
## *Stable Product*



## *. Toyogawa Comprehensive Canal Project*

- Ohshima Dam (Effective Storage 11.3 million m<sup>3</sup>)
- Kansagawa Headworks (Max. intake 15m<sup>3</sup>/s)
- Kansagawa Link Canal (Max. intake 15m<sup>3</sup>/s)
- Regulating Reservoir
  - Ohbara (Effective Storage 2 million m<sup>3</sup>)
  - Banba (Effective Storage 5 million m<sup>3</sup>)
  - Ashigaike (Effective Storage 2 million m<sup>3</sup>)
  - Gamagori (Effective Storage 500 thousand m<sup>3</sup>)







## *.Toyogawa Canal Second Stage Project*

### **Purpose**

**Reconstruction of deteriorated facilities to supply stable water safety in future and modernize the O&M system.**

### **Project**

**Reconstruction of canal ;34.2kn**

**(Eastern main canal;13.4km,western main canal;7.4km,Muro-Matubara main canal;13.4km)**

**Construction of pipeline ;58.2km (Bypass canal )**

**(Eastern pipeline;34.1km,western pipeline;24.1km)**

**Reconstruction of Branch canal ;51.0km**

### **Term of project**

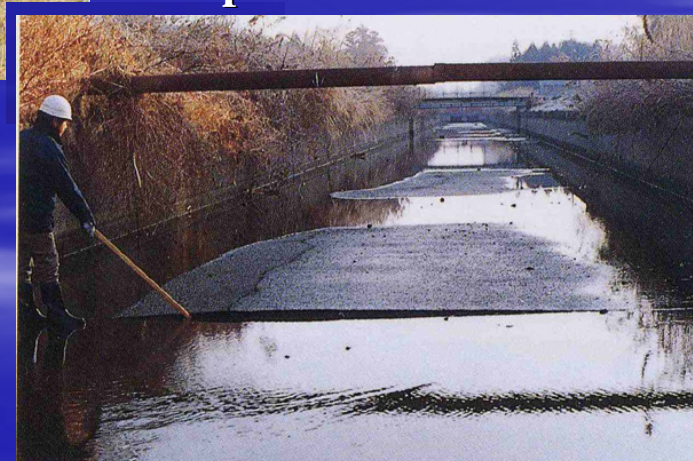
**1999 ~ 2015**

## *Deterioration of Facilities*



**Cracked Lining**

**Uplifted Bed Slab**





## Accident Occurs Frequently!



長山サイホンにおける  
漏水事故  
(S59.2.20 一宮町)



牟呂用水における  
堤防崩壊事故  
(H2.9.30 豊橋市)



伊良湖サイホンにおける  
管の破損事故  
(H5.9.7 渥美町)



## Outline of Toyogawa Canal Second Stage Project

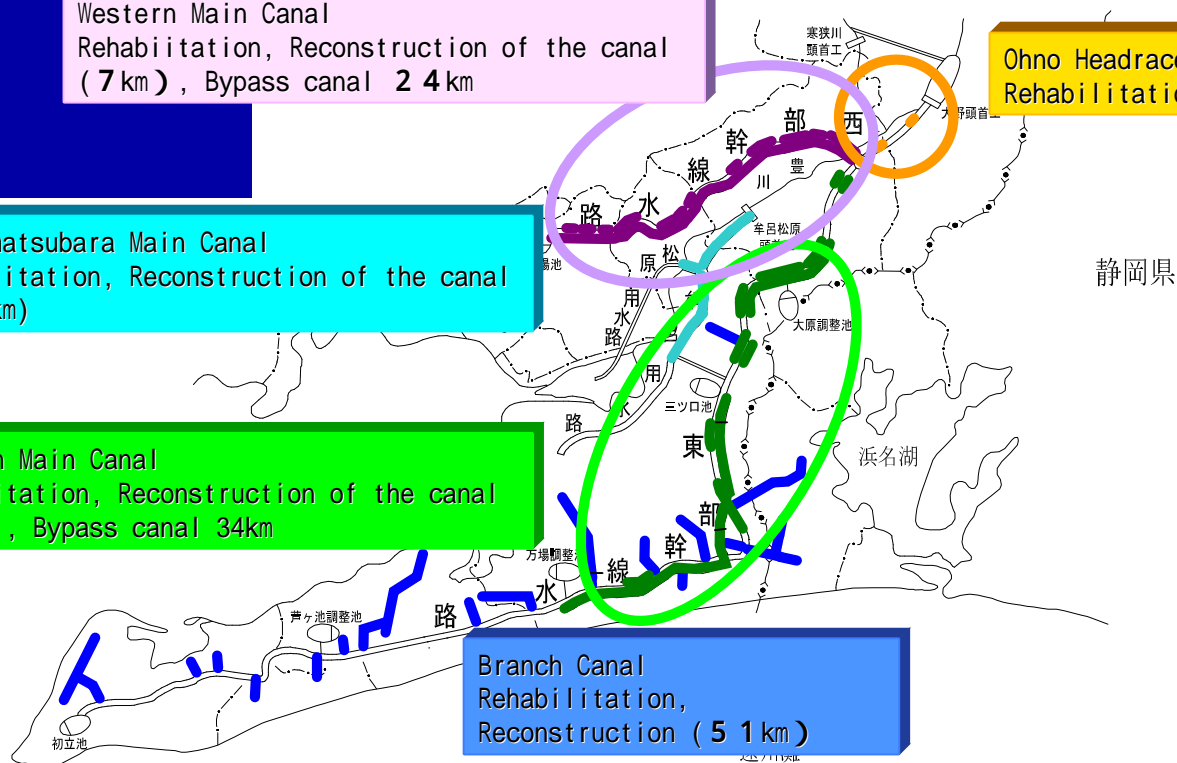
Western Main Canal  
Rehabilitation, Reconstruction of the canal  
(7 km), Bypass canal 24 km

Ohno Headrace  
Rehabilitation

Muro-matsubara Main Canal  
Rehabilitation, Reconstruction of the canal  
(14 km)

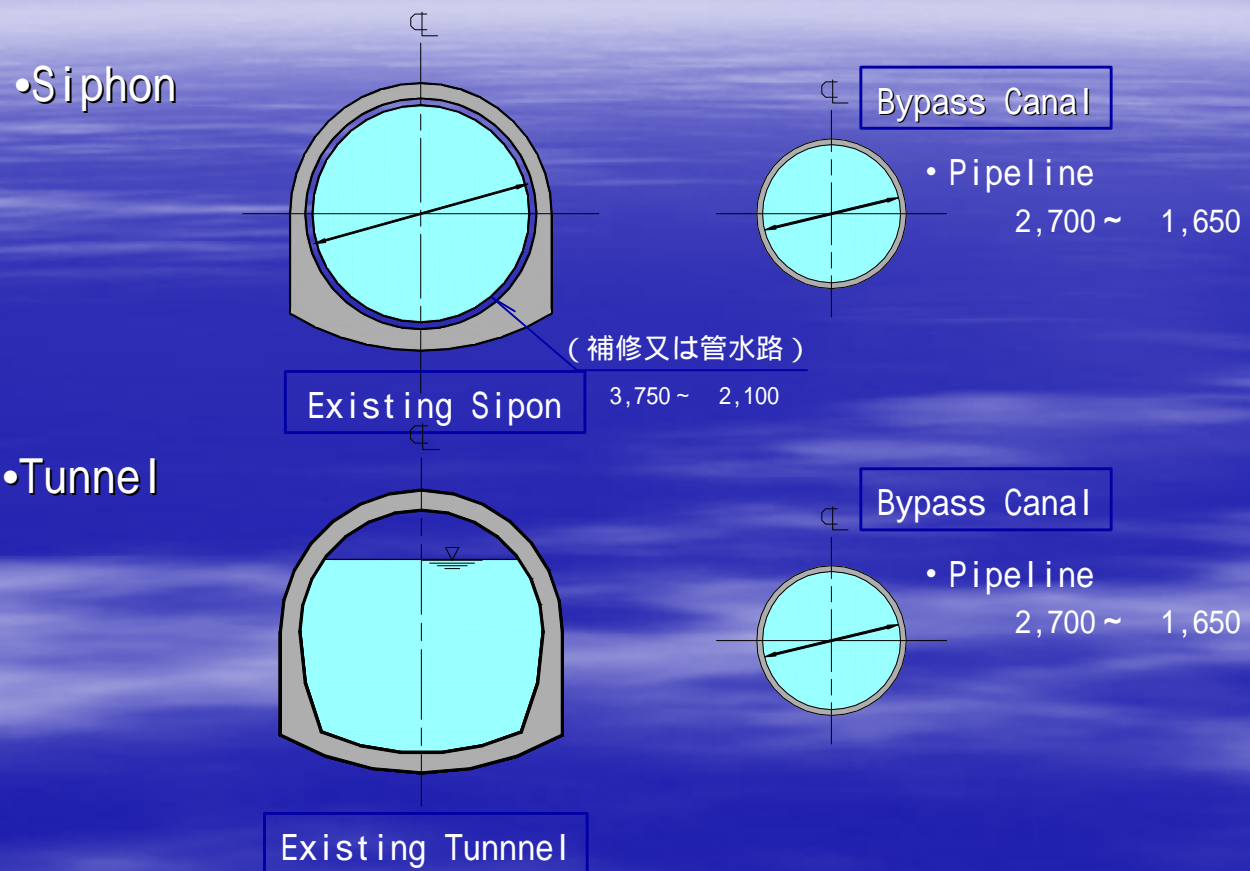
Eastern Main Canal  
Rehabilitation, Reconstruction of the canal  
(13 km), Bypass canal 34 km

Branch Canal  
Rehabilitation,  
Reconstruction (51 km)





## Main Canal and Bypass Canal Section



## 《Eastern Main Canal》



トンネル工法  
(NATM)

完成断面  
(円形)  
2700





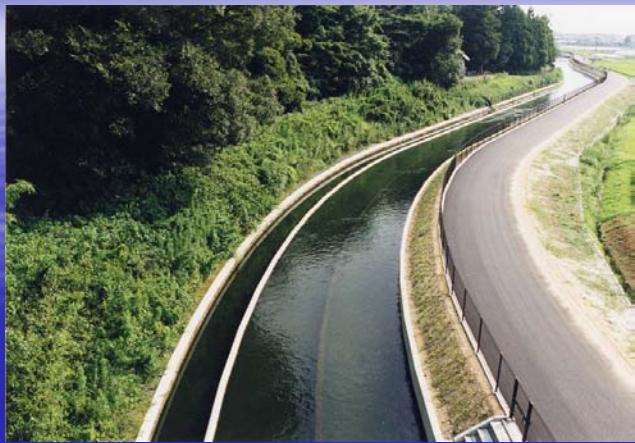
《Western Main Canal》



Open-cut Method  
Steel Pipe  
1800



《Muro-matsubara Main Canal》



drainage



drainage



drainage



drainage



*Thank you very much for  
your warm attention!*



**Ohshima Dam**