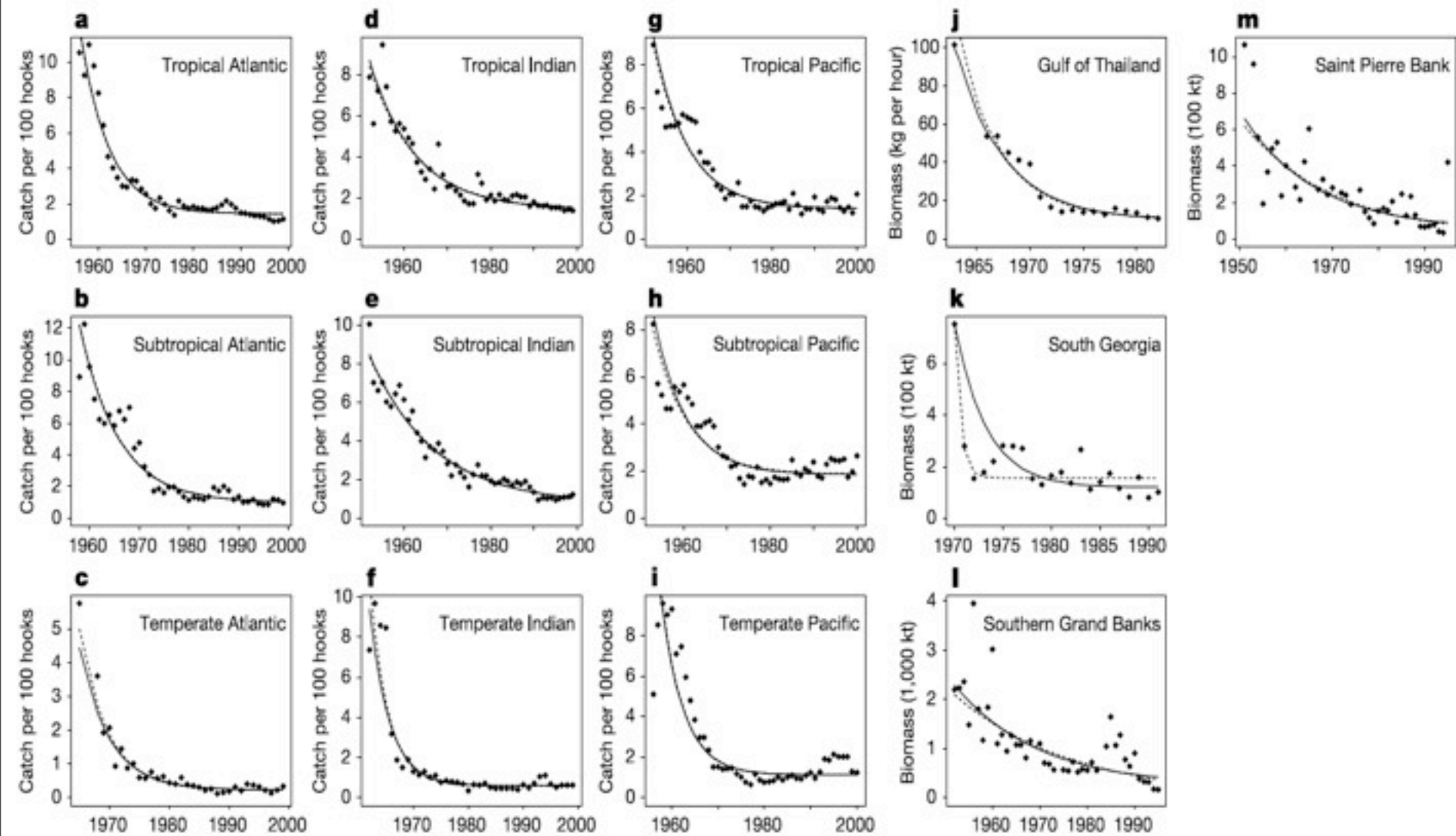


# **Canola in Trout and Salmon Diets**

Murray Drew

Department of Animal and Poultry  
Science

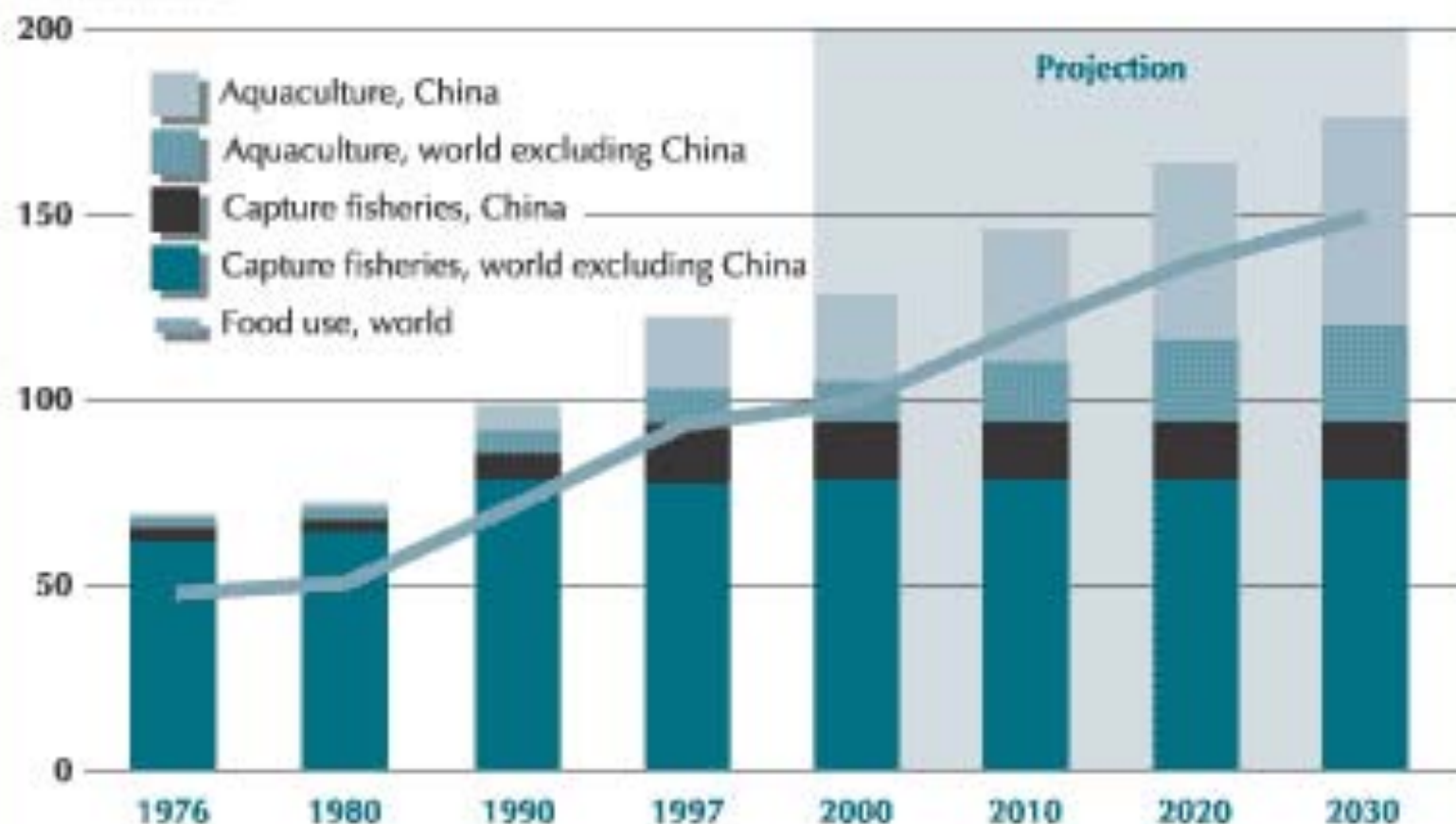
Wild fish stocks are in  
trouble!



**Figure 1** Time trends of community biomass in oceanic (a–i) and shelf (j–m) ecosystems. Relative biomass estimates from the beginning of industrialized fishing (solid points) are shown with superimposed fitted curves from individual maximum-likelihood fits (solid lines) and empirical Bayes predictions from a mixed-model fit (dashed lines).

# Worm's Conclusions

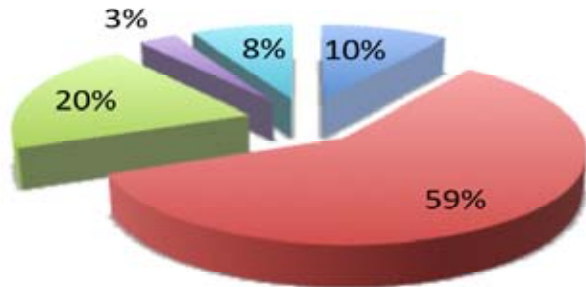
- Fishery species diversity and productivity are decreasing worldwide
- Trends indicate the global collapse of all fisheries by the mid-21<sup>st</sup> century (2048) (defined as less than 10% of historic maximum)

**FIGURE 47****World fish production and food use consumption 1976–2030***Million tonnes*

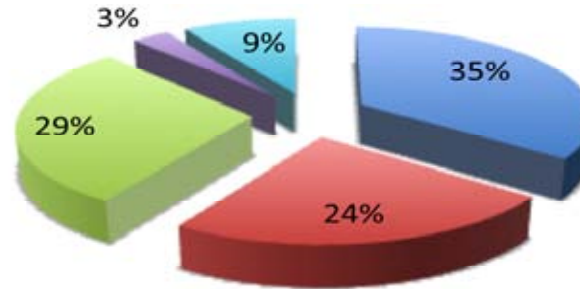
Note: Data are from the Global 1 report; in general they are supported by the Global 2 report.

# Use of fishmeal 1988-2010

1988

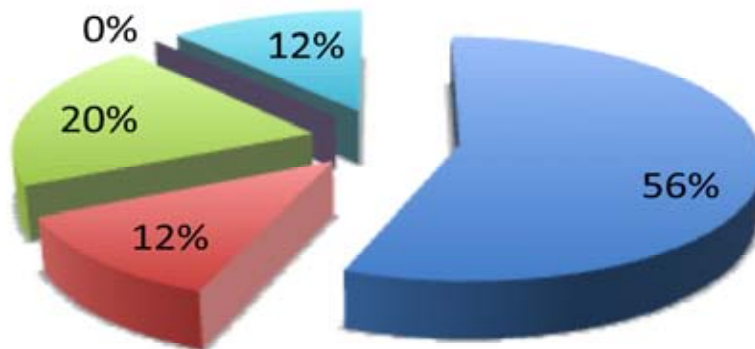


2000



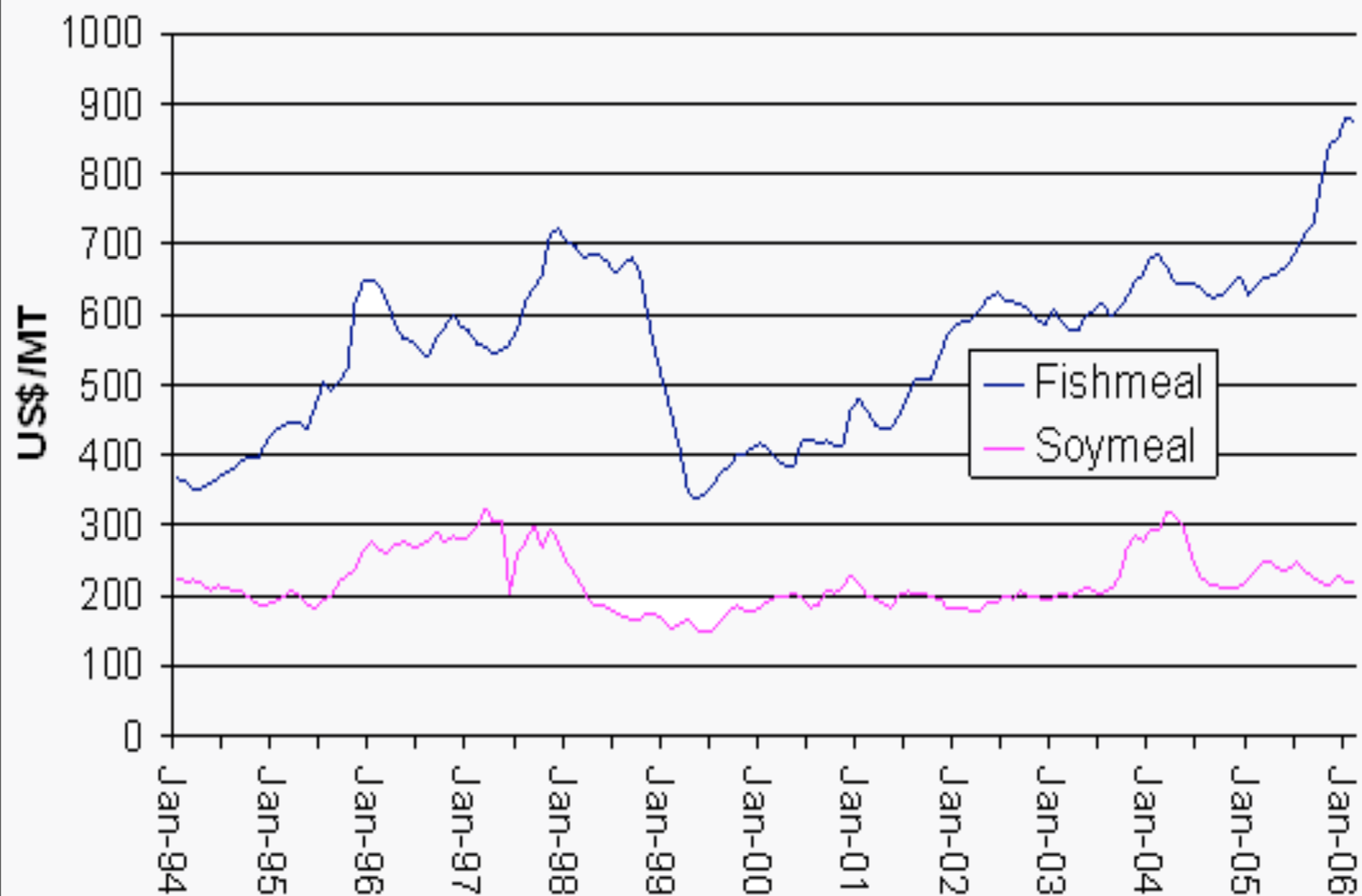
- Aquaculture
- Poultry
- Pigs
- Ruminants
- Others

2010



- Aquaculture
- Poultry
- Pigs
- Ruminants
- Others

## Fishmeal and soymeal prices



How will we replace fish  
meal?

# Nutritional Properties of fish meal and some plant proteins use in aquaculture

	Crude Protein	PER	Heat Labile ANF	Heat Stable ANF
Fish Meal	50–72	3.1–3.7		
Soybean Meal	48	1.60	trypsin inhibitor, lectins	saponins, NSP, phytate, phytoestrogens, protein antigens
Canola	38	3.29	glucosinolates	phytate, tannins, sinapine, fibre, phenolic compounds
Peas	23	1.56	protease inhibitors, lectins, cyanogens	saponins, starch, phytic acid, protein antigens
Flax	25	2.88	cyanogenic glycosides,	mucilage and NSP

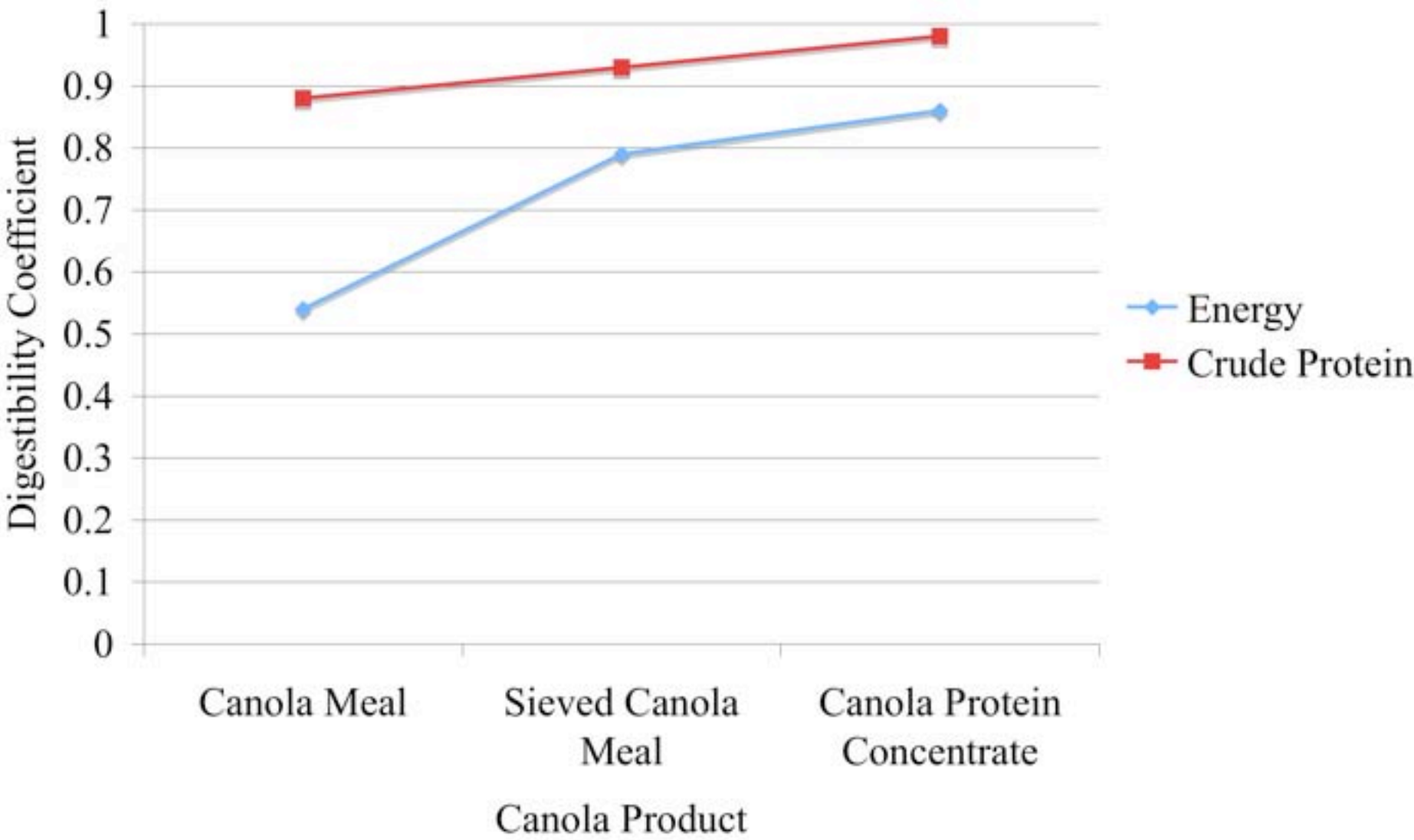
# Strategy for Replacing Fish Meal with Plant Proteins

- Produce Protein concentrates
  - Increase protein concentration
  - remove antinutritional factors

# Effect of Processing on Nutrient Density of Canola

Crop	Protein (%)	DE Trout (Mcal/Kg)
Corn Gluten Meal	63.1	4.26
Soybean Meal	47.5	2.90
Canola Meal	36–38	2.60
Sieved Canola Meal	43	2.43
Canola Protein Concentrate	60–70	4.31

# Effect of processing canola on energy and protein digestibility in Rainbow Trout

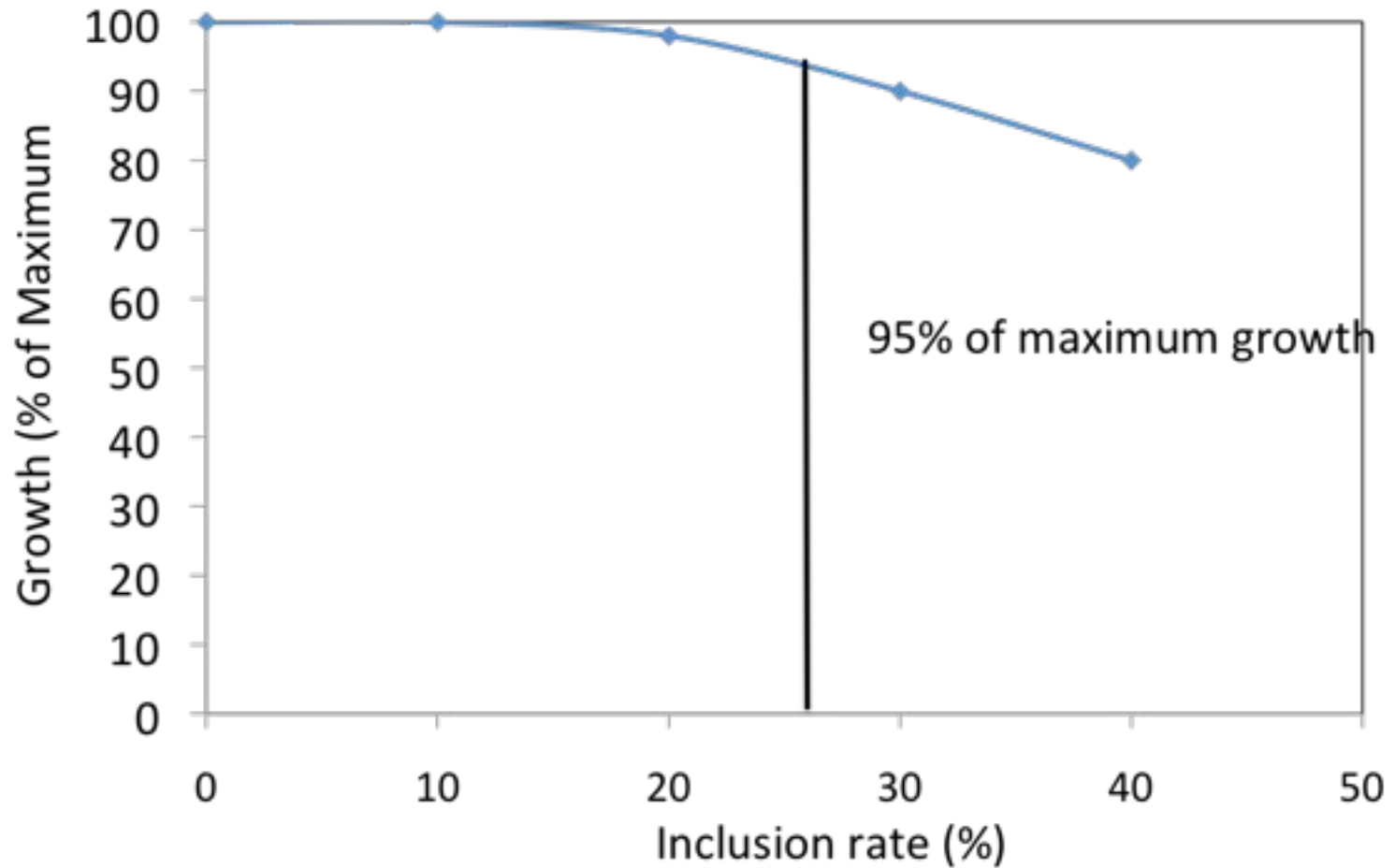


Effect of inclusion rate of

# Objectives

- Determine the relationship between the growth performance of rainbow trout and inclusion rate of:
  - Canola meal
  - Canola Protein Concentrate
  - Pea meal
  - Pea Protein Concentrate
  - Soybean meal
  - Soybean Protein Concentrate

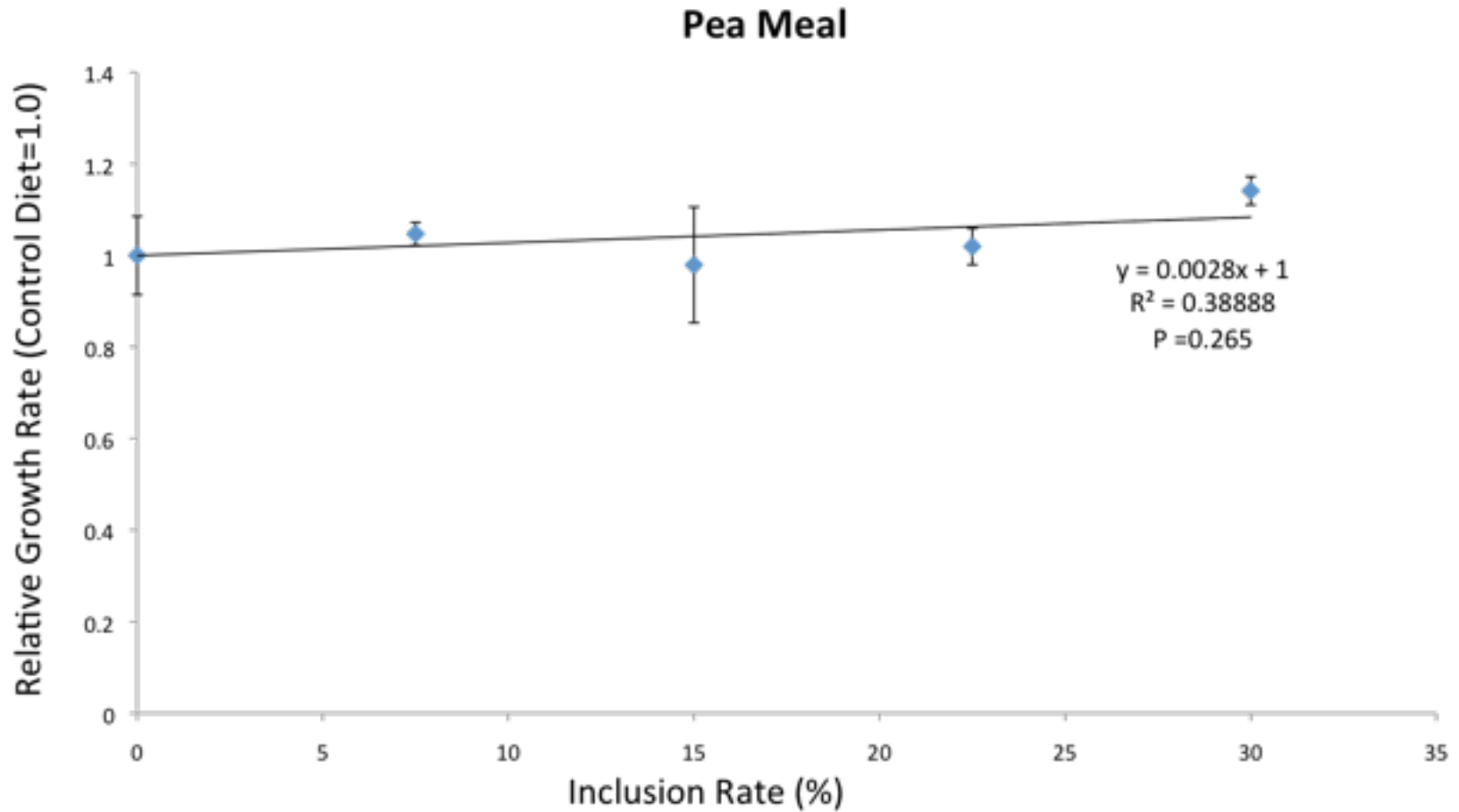
# Growth Model



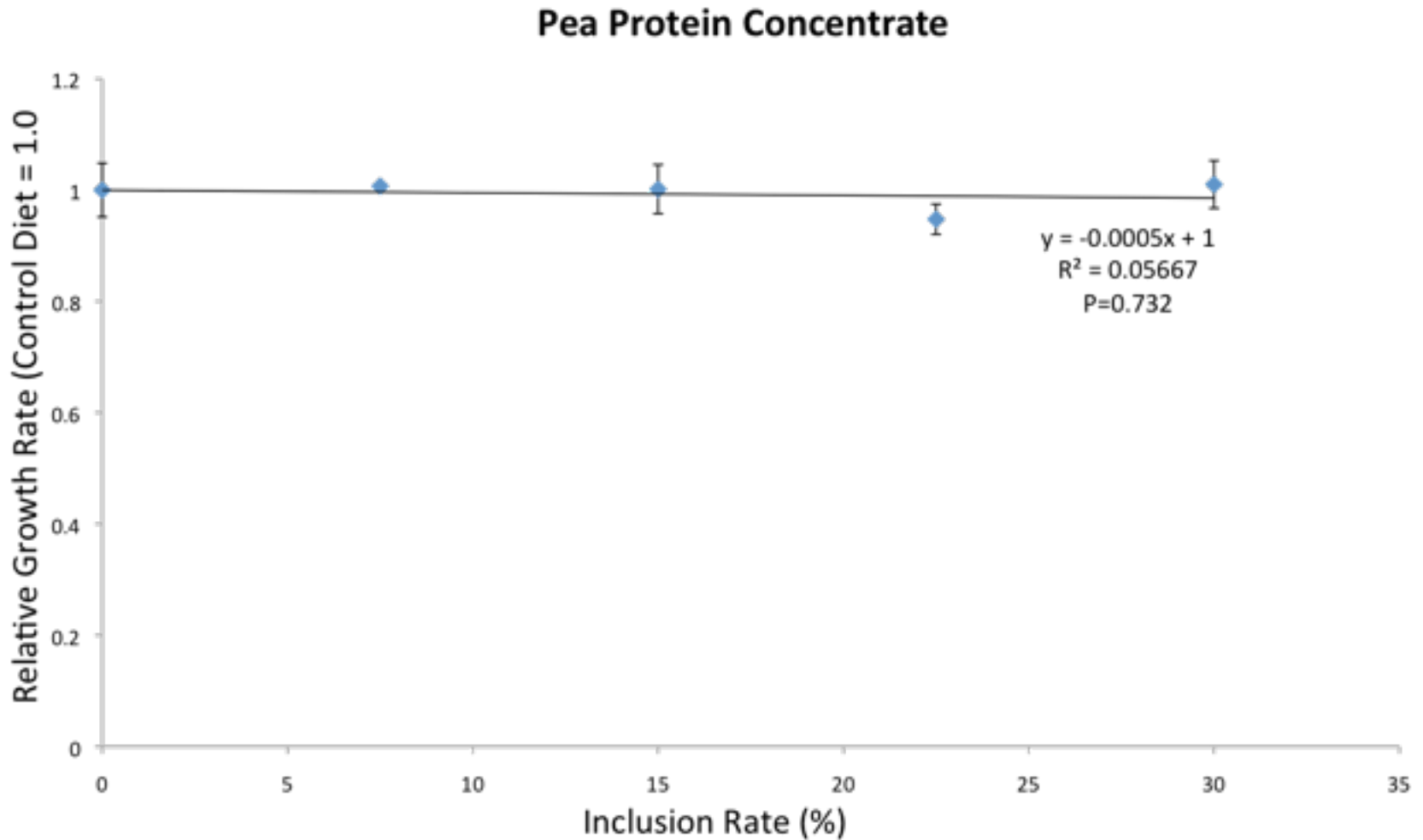
# Fish Growth Trials

- Fish were fed diets containing 0, 7.5, 15, 22.5 and 30% of each ingredient
- Diets were balanced for digestible energy and amino acids
- Fish were fed ad lib for 12 weeks
- Regression analysis was used to determine the relationship (linear or quadratic) between inclusion rate and growth

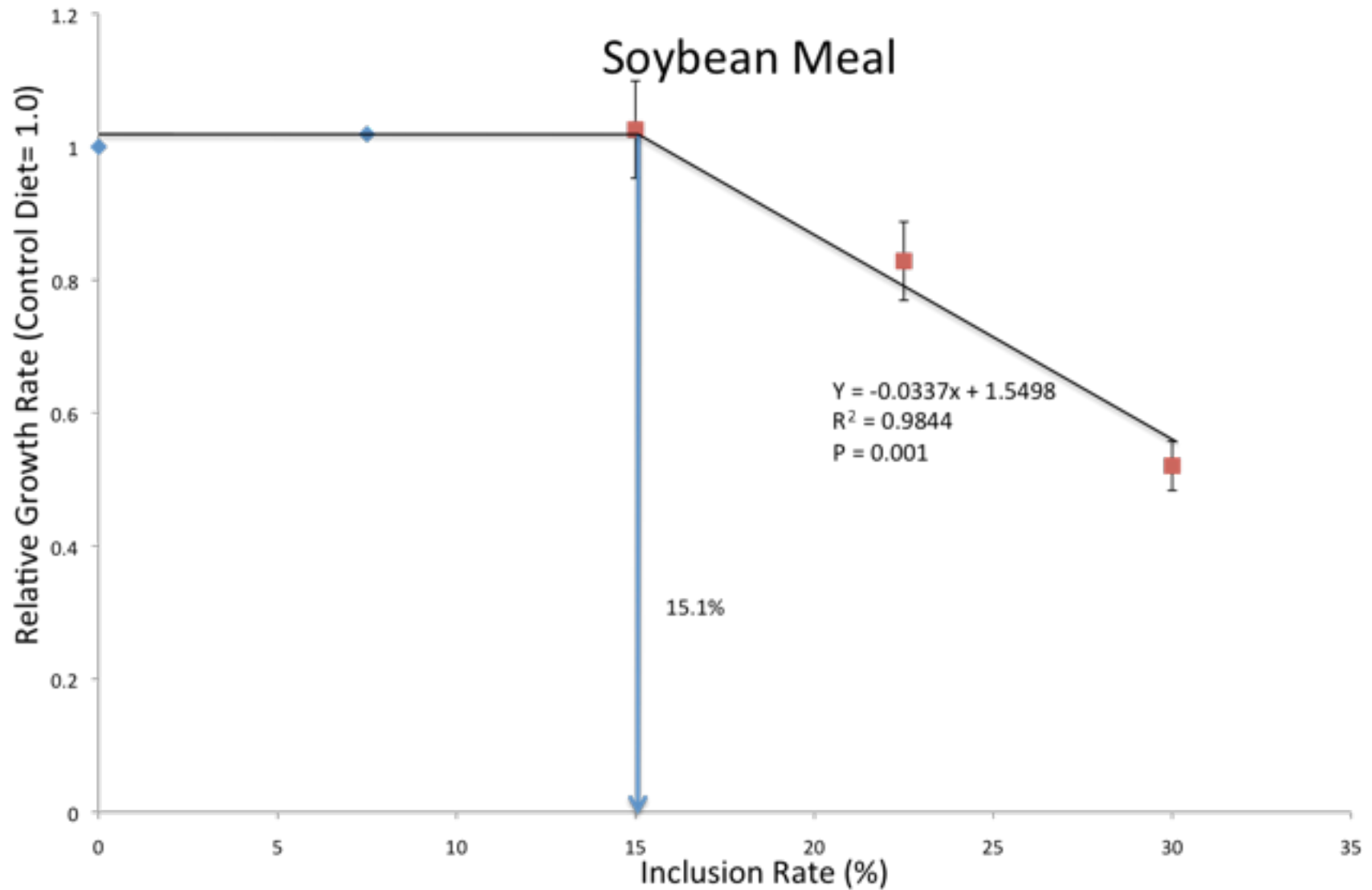
# Pea Meal



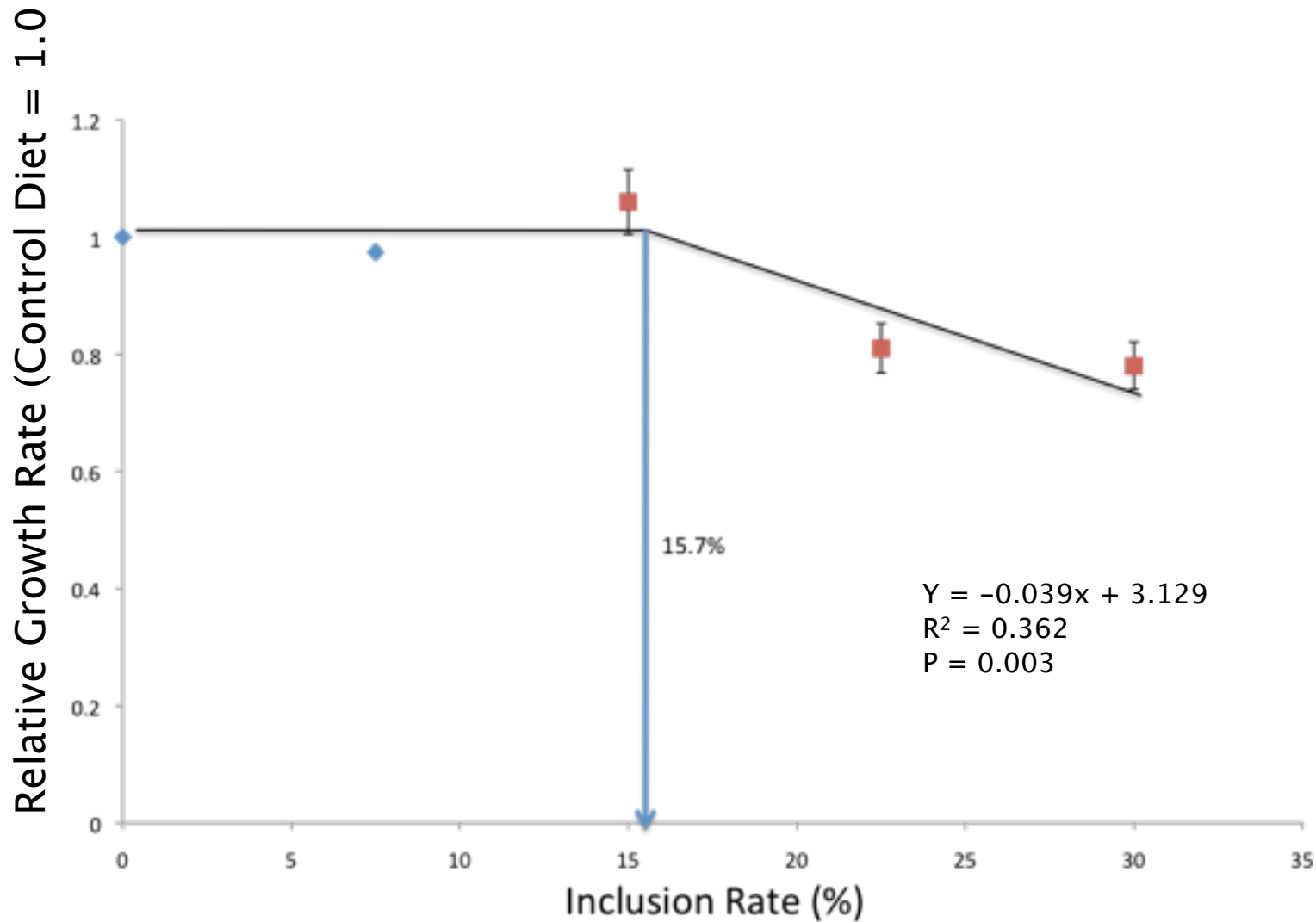
# Pea Protein Concentrate



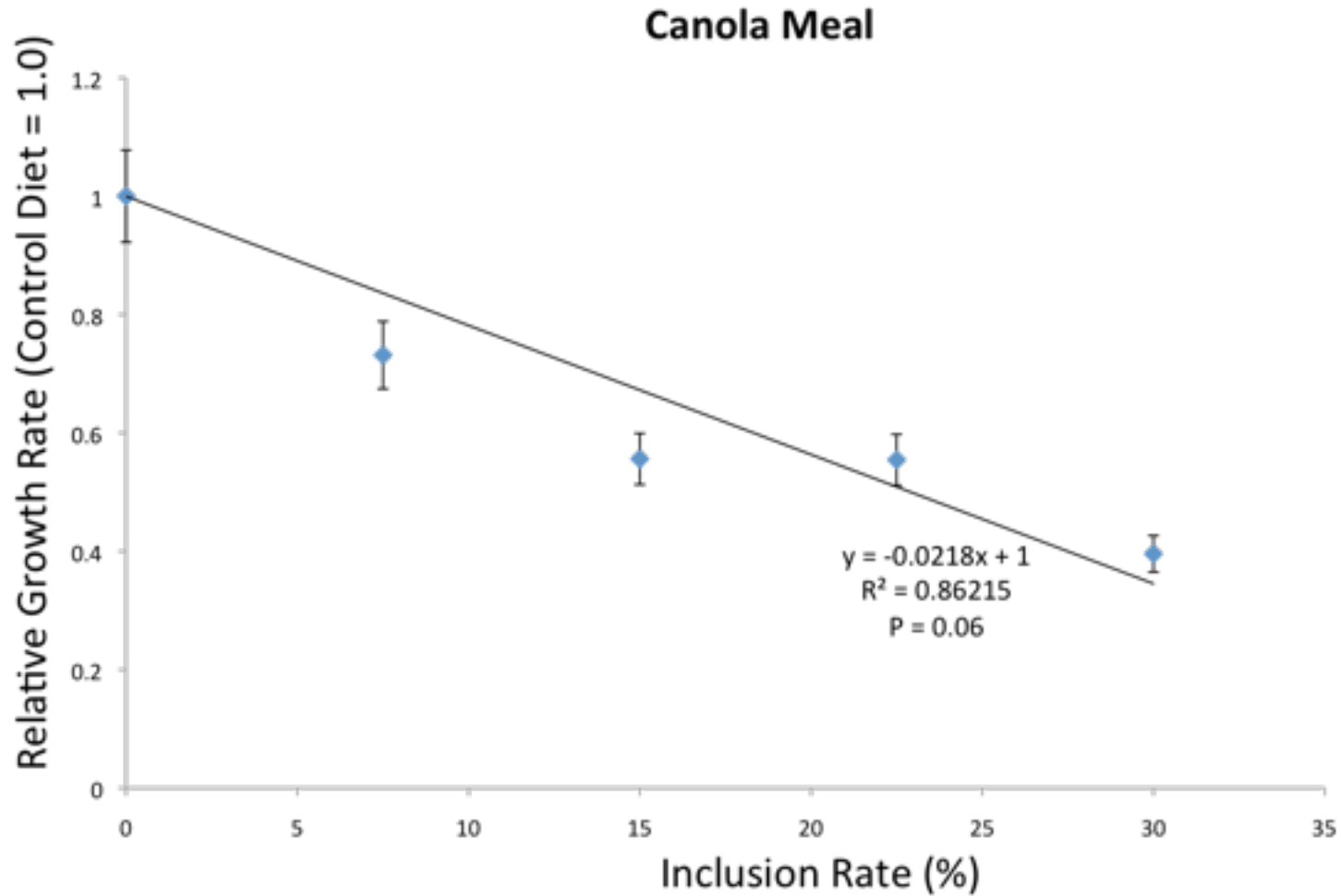
# Soybean Meal



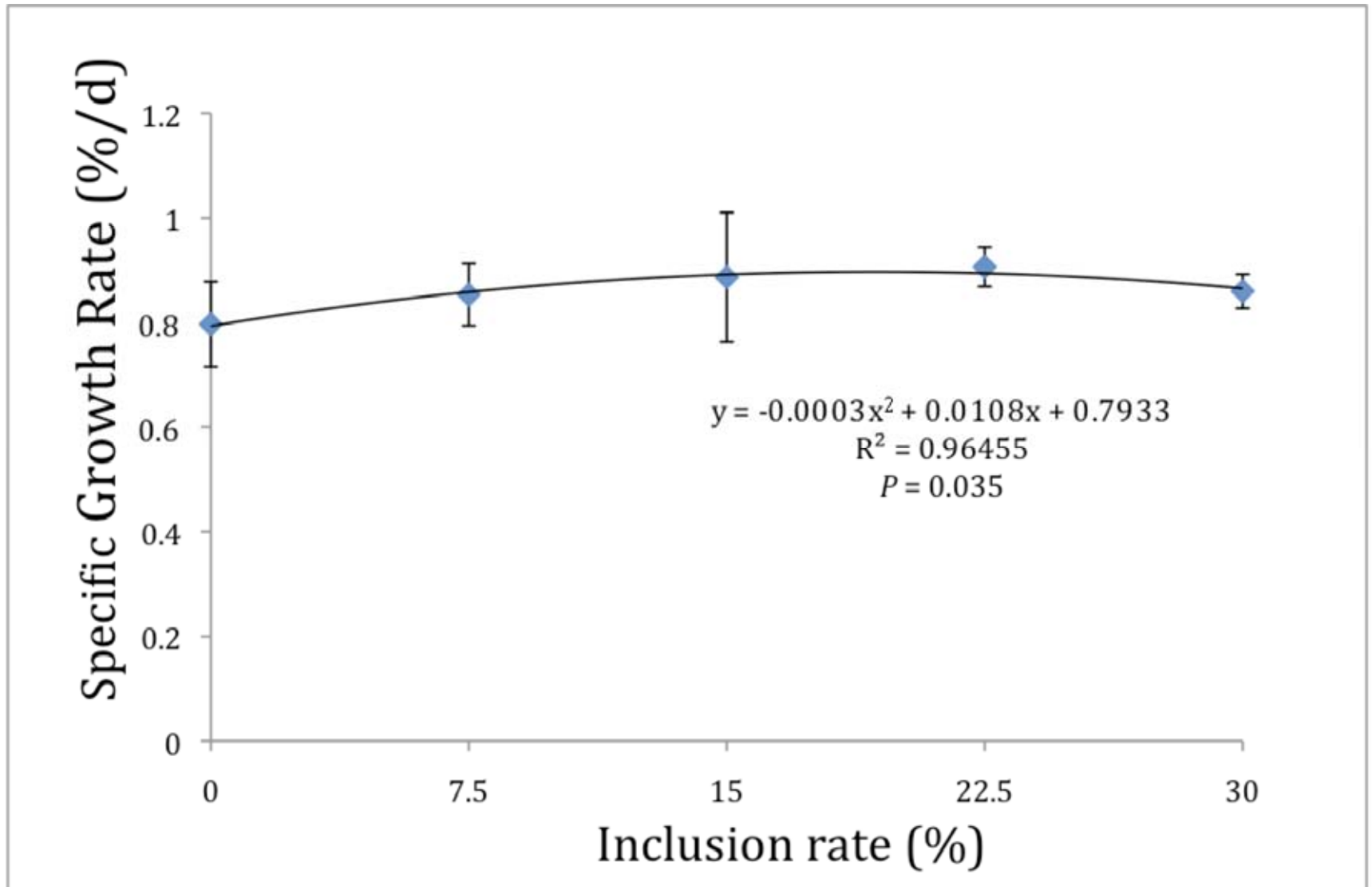
# Soy Protein Concentrate



# Canola Meal



# Canola Protein Concentrate



# Conclusions

- Canola meal is not a good ingredient for rainbow trout
- Canola protein concentrate may actually increase the growth of rainbow trout when added to a commercial-type diet

# Acknowledgements



A group of five people, two men and three women, are standing behind a large, rectangular sign. The sign is made of a light-colored, textured material, possibly concrete or stone, and features a dark brown rectangular panel in the center. On this panel, the word "AQUACULTURE" is written in large, bold, black, sans-serif capital letters. The people are dressed in casual summer attire, including t-shirts, polo shirts, and tank tops. They are all smiling or looking towards the camera. The background consists of a light-colored, vertically-ribbed wall and a green lawn.

**AQUACULTURE**