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Sustainable Use of Water in the Food and Beverage Sector through Product Water Footprint Labeling

WITH EMPIRICAL EVIDENCE FROM THAILAND

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ABBREVIATIONS

CDM	The Clean Development Mechanism
CDP	The Carbon Disclosure Project
CPF	Charoen Pokphand Foods Public Company Limited
CSR	Corporate Social Responsibility
DFID	The Department for International Development
DIY	Do it yourself
DNA-CDM	The Designated National Authority for the CDM
EEA	The European Environment Agency
EMA	Environmental Management Accounting
EMO	Environmental Movers Organization
ESG	Environmental, Social and Governance
EU	The European Union
FAO	The Food and Agriculture Organization of the United Nations
FoEI	Friends of the Earth International
FSC	The Forest Stewardship Council
GATT	The General Agreement on Tariff and Trade
GHG	Greenhouse Gas
ha	Hectare
HACCP	Hazard Analysis Critical Control Point
IFOAM	International Federation of Organic Agriculture Movements
ISO	International Organization for Standardization
ITC	The International Trade Centre
JS-APMDD	Jubilee South-Asia Pacific Movement on Debt and Development
KPI	Key Performance Indicator
LCA	Life-Cycle-Assessment
LCI	Life-Cycle-Inventory
m^3	Cubic meter
MRE	Marine Resource Economics
MSC	The Marine Stewardship Council
MTEC	The National Metal and Materials Technology Center
NASA	The National Aeronautics and Space Administration
NBIM	Norges Bank Investment Management
NESDB	National Economic and Social Development Board of Thailand
NGOs	Non-governmental organizations
NPOs	Non-profit organizations
OECD	The Organization for Economic Cooperation and Development

PWFL	Product Water Footprint Label
QR	Quick Response
SEC	Securities and Exchange Commission
SFI	The American Forest and Paper Association's Sustainable Forestry Initiative
SPSS	Statistical Package for the Social Sciences
SRI	Socially Responsible Investing
SSNC	The Swedish Society for Nature Conservation
TBT	The Agreement on Technical Barriers to Trade
TCCC	The Coca-Cola Company
TDRI	Thailand Development and Research Institute
TGO	Thailand Greenhouse Gas Management Organization
UK	The United Kingdom
UN	The United Nations
UNCTAD	The United Nations Conference on Trade and Development
UNDP	The United Nations Development Programme
UNEP	The United Nations Environment Programme
URL	Uniform Resource Locator
U.S.	The United States of America
USP	Unique Selling Proposition
WBCSD	The World Business Council for Sustainable Development
WEF	The World Economic Forum
WFN	Water Footprint Network
WTO	The World Trade Organization
WTP	Willingness to pay
WWF	The World Wide Fund for Nature

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งานวิทยานิพนธ์ฉบับนี้จะไม่สามารถสำเร็จได้ หากปราศจากการช่วยเหลือของบุคคลดังต่อไปนี้ ดิฉันขอแสดงความขอบคุณผู้-ตรวจสอบงานวิทยานิพนธ์ลำดับที่หนึ่ง ดร. ชาลอตเทอร์ เฮสเซลบาร์ท ที่ให้คำแนะนำในการจัดวางโครงร่างและเรียบเรียงวิทยานิพนธ์, ผู้ตรวจสอบงานวิทยานิพนธ์ลำดับที่สอง ดร. ไมเทอร์ อัลดายา ที่สละเวลาให้คำแนะนำ, ผู้ให้สัมภาษณ์ ได้แก่ คุณกุหลาบ กิมศรี และ ดร. พงษ์วิภา หล่อสมบูรณ์ ที่ร่วมแบ่งปันข้อมูลที่เกี่ยวข้องกับการทำฉลากเพื่อสิ่งแวดล้อมและอุต-สาหกรรมอาหารในประเทศไทย, ผู้เชี่ยวชาญและนักวิชาการด้าน water footprint ได้แก่ ศ. อาเยรียล วาย ฮือเอสตร้า และ ดร. เอริก้า ซาราเทอร์ ที่ให้ความรู้และความเห็นเกี่ยวกับ water footprint, เพื่อนร่วมศึกษาปริญญาโทด้าน MBA ได้แก่ คุณแอนนา เวริทซ์ และ ดร. ราล์ฟ เรซ์ส ที่ให้ความคิดเห็นเพิ่มเติมรวมไปถึงความคิดสร้างสรรค์ที่ส่งผลให้วิทยานิพนธ์ฉบับนี้สมบูรณ์มากยิ่งขึ้น, เพื่อนที่ดีในเมืองลือเนบวร์ก ณ ประเทศเยอรมนี ได้แก่ คุณบาฮาเดีย อูซุน, คุณเบเนดิค เอ็ม เบาเออร์ และ คุณนาธาน อาร์ เฮาเกอร์ ที่ช่วยจัดหาโปรแกรม SPSS และให้ความรู้พื้นฐานด้านทฤษฎีสถิติเบื้องต้น, ผู้แก้ไขไวยกรณ์ภาษาต่างประเทศ ได้แก่ ดร. จิล ฮือทาจิ, คุณไรน์ฮาร์ด แวร์เนอร์, คุณเทรย์, คุณพรกมล วงศ์ไพรกรณ์ และ คุณเดิร์ค บรุนห์ และสุดท้ายคือชาวไทยทุกท่าน ที่ร่วมแสดงความคิดเห็นและสละเวลากรอก แบบสอบถามทั้ง ๑๓๕ ท่าน โดยเฉพาะคุณกานดาวดี เดชดำรง
ดิฉันขอแสดงความขอบคุณอย่างสุดซึ้งต่อครอบครัวในประเทศไทย รวมไปถึง ผศ. ดวงมณี โกมารทัต ที่คอยให้ความรักและความเชื่อมั่นว่าดิฉันจะสามารถทำงานวิจัยนี้ได้สำเร็จลุล่วงไปด้วยดี ขอขอบพระคุณทุกท่านเป็นอย่างสูงมา ณ โอกาสนี้

Lüneburg, June 2011

ABSTRACT

English

„Die ich rief, die Geister, Werd' ich nun nicht los."
Johann Wolfgang von Goethe

Oil is well known as "black gold" and classified as one of the most valuable natural resource. However, water is more important than oil because it is a basic element of every single life form including humans, animals, and plants. Nothing can replace water. Unfortunately, it does not receive the appreciation it should as the most valuable natural resource of the world. In addition to sustaining every life on this planet, water sustains the global economy and society because every single product and service requires water. It is not an exaggeration to say that our businesses run on water. Furthermore, water shortage is strongly bound to food security, and food is an element for human life as well. Due to globalization and the liberalization of food trade, the scope of water scarcity is not restricted to one place; it translates into food shortage in another place.

This is the time to realize that we now live in a resource-constrained world, mostly owing to human activities. Some already notice this challenge, but some do not. Everyone is indeed responsible for changing the misperception of water, solving water problems, and preserving it for its own sake as well as for the next generation. As a result, first and foremost, water must be treated and perceived as a sort of "white oil" or "blue gold".

This research suggests that a market-based instrument could be used as a tool to create sustainable water consumption. The "Product Water Footprint Label (PWFL)" as a market-driver instrument should be developed. It holds the potential to motivate businesses in the food and beverage sector to improve their supply chain to use less water in their production processes. As a result, alternative water management approaches and technologies would be implemented in order to maintain or create business competitive advantages and ensure long-term cost effectiveness with regard to water resources. Ultimately, these would lead to sustainable use of water resources. The securing of water resources, even partly, would create a domino effect, in that food supplies would also become secure. In addition to satisfying a basic human need, social conflicts such as water wars or starvation would be avoided.

"Anyone who can solve the problems of water will be worthy of two Nobel Prizes - one for Peace and one for Science".
John F. Kennedy

German

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Öl ist bekannt als „schwarzes Gold" und wird als eines der wertvollsten Naturressourcen der Erde eingeschätzt. Das Wasser ist dagegen wichtiger als das Öl, weil es ein Grundelement jedes Lebens ist: Menschen, Tiere und Pflanzen sind abhängig vom Wasser. Nichts kann die Funktion des Wassers ersetzen. Leider wird die Bedeutung von Wasser immer noch in den meisten Regionen der Welt unterschätzt. Das Wasser erhält nicht nur jedes Lebewesen auf diesem Planeten am Leben. Die Herstellung von jedweden Produkten ist ohne Wasser nicht zu denken. Darüber hinaus gibt es einen starken Zusammenhang zwischen Wasserknappheit und der Grundlage für die Ernährung. Aufgrund der Globalisierung und der Liberalisierung des Lebensmittelhandels betrifft die Wirkung der Wasserknappheit nicht nur eine jeweilige Region, sondern weitet sich immer mehr aus und kann schließlich zur Knappheit von Lebensmitteln führen.

Jetzt ist noch die Zeit unbequeme Wahrheiten zu begreifen – wir leben in einer Welt, deren Ressourcen infolge des weltweit gestiegenen Konsums immer knapper werden. Im eigenen Interesse sind die jetzigen und die nachfolgenden Generationen im hohen Maße für einen nachhaltigen Umgang mit der Ressource Wasser verantwortlich. Es bedarf größter Anstrengungen, auf die essentielle Bedeutung des Wassers in der breiten Öffentlichkeit hinzuwirken. Es sollte weniger vom „schwarzen Gold" als vielmehr vom „weißen Öl" oder „blauen Gold" die Rede sein.

In dieser Arbeit soll eine alternative Lösung vorgeschlagen werden, wie ein marktwirtschaftliches Instrument als ein Tool genutzt werden kann, um einen nachhaltigen Wasserverbrauch in der Lebensmittelindustrie hervorzubringen. Das „Product Water Footprint Label (PWFL)" sollte als ein marktgerechtes Instrument entwickelt werden, das Lebensmittelunternehmen motiviert, bei ihrer Beschaffungskette weniger Wasser zu verbrauchen. Demzufolge werden alternative Wassermanagementansätze und Technologien implementiert, um Wettbewerbsvorteile aufrechtzuerhalten oder zu erstellen und die langfristige Kostenwirksamkeit bezüglich des Wassers zu gewährleisten. Wenn Wasserressourcen wenigstens teilweise geschützt werden, dann steigt die Wahrscheinlichkeit zur Schaffung eines gesicherten Angebots von Grundnahrungsmitteln. Dies könnte zu einer Befriedigung von menschlichen Grundbedürfnissen und damit zu einer Begrenzung von Konflikten wie Krieg um Wasser oder Unterernährung führen.

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Thai

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น้ำมันเป็นที่รู้จักในอีกชื่อว่า "ทองคำสีดำ" และจัดเป็นหนึ่งในทรัพยากรธรรมชาติที่มีค่าที่สุด แต่ในความเป็นจริง น้ำมีความสำคัญมากกว่าน้ำมัน เนื่องจากน้ำเป็นองค์ประกอบพื้นฐานของสิ่งมีชีวิตทุกชนิด ได้แก่ มนุษย์ สัตว์ และพืชพันธุ์ต่างๆ ไม่มีสิ่งใดสามารถใช้ทดแทนน้ำได้ แต่น่าเสียดายที่น้ำกลับได้รับการประเมินค่า และให้ความสำคัญน้อยกว่าคุณค่าที่แท้จริงของมัน ซึ่งก็คือทรัพยากรธรรมชาติที่มีค่าที่สุดในโลกใบนี้ น้ำไม่เพียงหล่อเลี้ยงทุกชีวิตบนดาวเคราะห์ดวงนี้ แต่ยังอุปถัมภ์เศรษฐกิจและสังคมโลกอีกด้วย เพราะผลิตภัณฑ์และบริการทุกชนิดต้องอาศัยน้ำเป็นส่วนประกอบ ดังนั้น หากจะกล่าวว่าธุรกิจดำเนินการอยู่บนน้ำ จึงไม่เป็นการกล่าวอ้างเกินจริงแต่อย่างใด นอกจากนี้ ภาวะขาดแคลนน้ำมีความเกี่ยวพันอย่างแน่นแฟ้นกับความมั่นคงทางอาหาร และอาหารก็เป็นปัจจัยพื้นฐานที่มนุษย์ขาดไม่ได้เช่นกัน เนื่องมาจากโลกาภิวัฒน์และการค้าอาหารอย่างเสรี เมื่อน้ำเกิดขาดแคลนผลกระทบจากภาวะขาดแคลนน้ำไม่ได้ถูกจำกัดอยู่เพียงที่นั้น แต่สามารถส่งผลให้เกิดภาวะการณ์ขาดแคลนอาหารในอีกที่หนึ่ง

ณ เวลานี้ เราควรจะตระหนักว่า พวกเราใช้ชีวิตอยู่ในโลกที่มีทรัพยากรอย่างจำกัด อันเกิดจากการบริโภคอย่างไร้ขอบเขตของมนุษย์นั่นเอง โดยแท้จริงแล้วทุกคนมีส่วนรับผิดชอบในการปรับเปลี่ยนความเข้าใจเกี่ยวกับทรัพยากรน้ำ ร่วมแก้ไขปัญหาที่เกี่ยวกับน้ำ และอนุรักษ์ทรัพยากรน้ำ ทั้งนี้ เพื่อตนเองและเพื่ออนุชนรุ่นหลัง โดยเริ่มจากปรับเปลี่ยน มุมมองของตนต่อทรัพยากรน้ำว่าน้ำเป็น "น้ำมันสีขาว" หรือ "ทองคำสีฟ้า" และเริ่มใช้น้ำอย่างคุ้มค่า

วิทยานิพนธ์ฉบับนี้มีจุดประสงค์ที่จะนำเสนอทางเลือกโดยใช้เครื่องมือทางการตลาดเป็นตัวช่วยผลักดันการใช้ทรัพยากรน้ำอย่างยั่งยืน "ฉลาก water footprint บนผลิตภัณฑ์ (PWFL)" คือ เครื่องมือทางการตลาดชิ้นหนึ่งที่ถูกพัฒนาขึ้นเพื่อกระตุ้นให้กลุ่มธุรกิจในอุตสาหกรรมอาหารและเครื่องดื่ม พัฒนาสายการผลิตให้ใช้น้ำในกระบวนการผลิตลดลง ด้วยเหตุนี้วิธีการบริหารจัดการน้ำและเทคโนโลยีที่เกี่ยวข้องจะถูกนำมาใช้ในการผลิต เพื่อที่จะรักษาหรือสร้างความสามารถในการแข่งขันของธุรกิจ และประกันความมีประสิทธิภาพทางด้านต้นทุนที่เกี่ยวกับน้ำในระยะยาว ในท้ายที่สุด เมื่อทรัพยากรน้ำแม้เพียงบางส่วนได้รับการรักษา อาหารได้รับการประกันว่ามีน้ำเพียงพอในการผลิต จะส่งผลให้ความต้องการขั้นพื้นฐานของมนุษย์ ได้รับการเติมเต็ม อีกทั้งช่วยหลีกเลี่ยงความขัดแย้งในสังคมที่อาจเกิดขึ้น อาทิเช่น การทำสงครามแย่งน้ำ หรือภาวะขาดอาหาร

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John F. Kennedy

1. INTRODUCTION

The world faces many challenges, ranging from natural disasters and global warming to depletion of natural resources. These environmental changes affect all aspects of the hydrological cycle, which may change the balance between food demand and supply in many parts of the world, especially in developing countries. Water availability, access, and use has ensured food and livelihood security for millions. These are challenged due to global climate change, which is projected to increase, leading to uncertainty over the onset of monsoons and more frequent extreme weather events, such as severe droughts and floods. Climate change also has the potential to change water quality significantly by changing temperatures, runoff rates and timing, and the ability of watersheds to assimilate waste and pollutants (cf. Ringler, 2010). While parallels have been drawn between potential water crises in the 21st century and the ongoing carbon crisis, it is the magnitude of these challenges on a global scale that is most relevant. It is crucial, however, to recognize that water is basically different from other resources for a number of reasons. The availability, management, and impact of water are local at the watershed or river basin level. This means that business risk regarding water is fundamentally related to location and exposure to water stress at the local level. Consequently, at that level, the most effective response is improved management, taking account of the local situation. This is the complete opposite of the global management and markets surrounding carbon footprint (cf. WWF, 2009), which is briefly explained in Section 2.3.6.

Water is typically variable in time and space, with the hydrological processes that underlie water availability, quality, and timing. Hence, the future of water generally has a significant degree of uncertainty. This implies that one watershed may be suffering extended drought, while relatively neighboring watersheds may be experiencing devastating floods. Neither of them can be predicted with any degree of certainty. This variability and uncertainty can be partially reduced by infrastructure that stores and moves water, e.g. reservoirs and pipelines. In the more arid parts of the world, this has created resilience and adaptation to change, which may serve these societies well under changing climatic, demographic and economic conditions (cf. WWF, 2009). Water was the prerequisite to establish life on our planet. Without clean water there is no human life. Without water in general there are no animals or plants. Water is one of the basic resources, but it is often in short supply. As a consequence, attempts have been made to economize the consumption of water (cf. Black, 2009). Historically, global freshwater use increased at a rate of about 20% per decade between 1960 and 2000, with considerable regional variations due to different development pressures and efficiency changes. However, because of the uneven distribution of freshwater in space and time today only 15% of the world's population lives with relative water abundance, and the majority is left with moderate to severe water stress (Ringler, 2010).

1.1 Problem Statement

We have a plenty of water in the ocean. Unfortunately, for nearly all of humanity's purposes such as drinking, washing, cooking, field-irrigation, or for most applications in industry, we need freshwater as it occurs on land. Using technology, salt water can be desalinized, but this is a costly and energy-intensive process, and is therefore, only feasible for a limited number of applications. Besides, salt water is available at the coast, while much of the need for water exists inland, so that transport uphill becomes an issue as well. In short, humans mainly depend on freshwater located on land. Most people imagine that water forms a cycle and is always somewhere in that cycle, but in different forms. As a result, freshwater on land is continuously replenished. However, its availability is not unlimited due to time and space (cf. Hoekstra et al., 2011). Figure 1.1 illustrates the water scarcity index, which shows that water overuse is damaging the environment in many major basins of the world. High overexploitation tends to occur in regions that rely heavily on irrigated agriculture, such as South Asia, North China, and North America, and in areas undergoing rapid urbanization and industrial development. Ecological stress shows up where human water use exceeds the level required to maintain the ecological integrity of river basins (UNDP, 2006). Ecological integrity means that there is enough water to sustain ecosystems, which includes the unused rainwater in agricultural production that is left to sustain natural vegetation, as well as the groundwater and surface water flows, which are not evaporated for human purposes or polluted and left to sustain healthy aquatic ecosystems (Hoekstra & Chapagain, 2008).

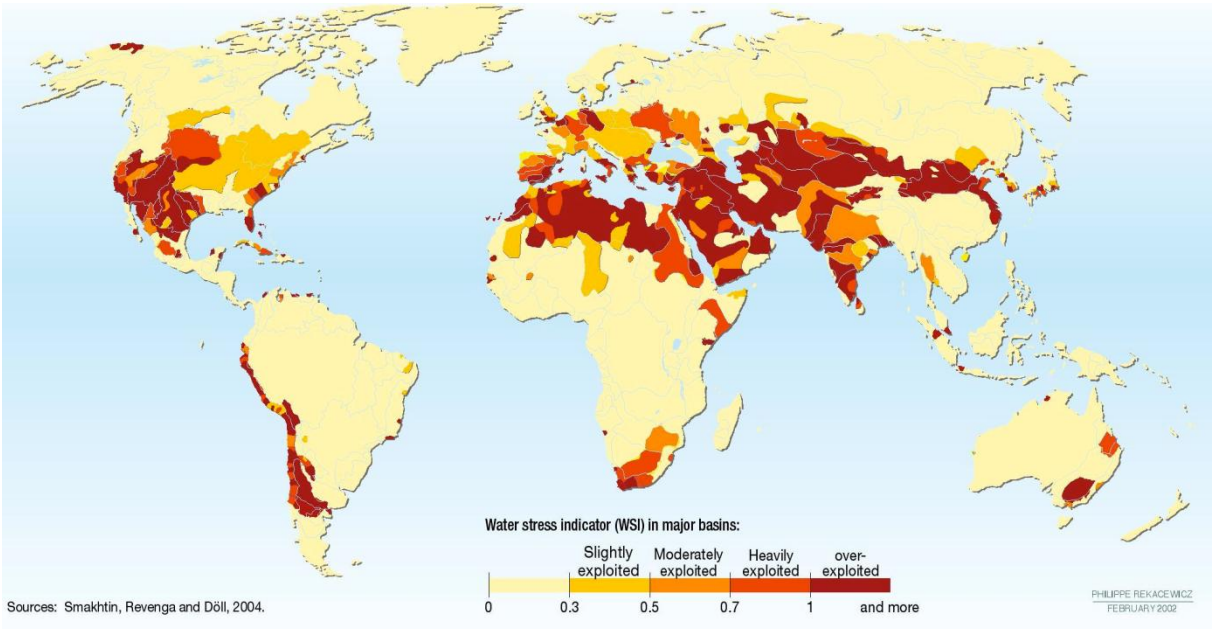


Figure 1.1: Water scarcity index (source: http://maps.grida.no/go/graphic/water-scarcity-index)

Alongside climate change, the existing and projected scarcity of clean water is likely to be one of the key challenges facing the world this century. In the next 40 years, the global population is expected to increase by three billion people, which means that a near doubling of water for irrigation will be required to feed these extra mouths. More dams will be built as economies develop, competition from the water needs of bio-energy crops will intensify, and pollution of water resources, which already exists, will continue (cf. Orr et al., 2009).

In short, the combination of rising global populations, rapid economic growth in developing countries, and climate change is triggering enormous water availability challenges around the world (Ceres, 2010).

Human's demand for water and the inappropriate allocation of water often cause water scarcity in some parts of the world, rather than by total availability of the natural resource. In other words, it is a governance crisis, not a (water) resource crisis. Indeed, on the global scale, there is probably enough water to supply present and future generations, if sound water management is utilized. However, to date, the track record on managing water effectively almost anywhere in the world is poor. The implications are clear that meeting the needs of society and the environment in the future will be heavily constrained by the scarcity of freshwater (Orr et al., 2009). An estimated 1.4 billion people now live in river basin areas that are closed, in that water use exceeds minimum recharge levels, and such basins cover more than 15% of the world's land surface. As millions of people in water-stressed areas are discovering, the environment is foreclosing on unsustainable water debts on an extensive scale. Some people in water-stressed areas have the economic resources, skills, and opportunities to leave their water problem behind. Many millions, such as small farmers, agricultural laborers, and pastoralists in poor countries, do not (UNDP, 2006). Figure 1.2 shows average water footprint[1] per capita per country from 1997 to 2001. Green-colored countries have a water footprint per capita equal to or less than the global average, whereas red-colored countries are above the global average. The global water footprint is 7,450 billion m^3/y, which equals 1,240 m^3/y per person and 3,397 liters per day per person on average (Hoekstra & Chapagain, 2008).

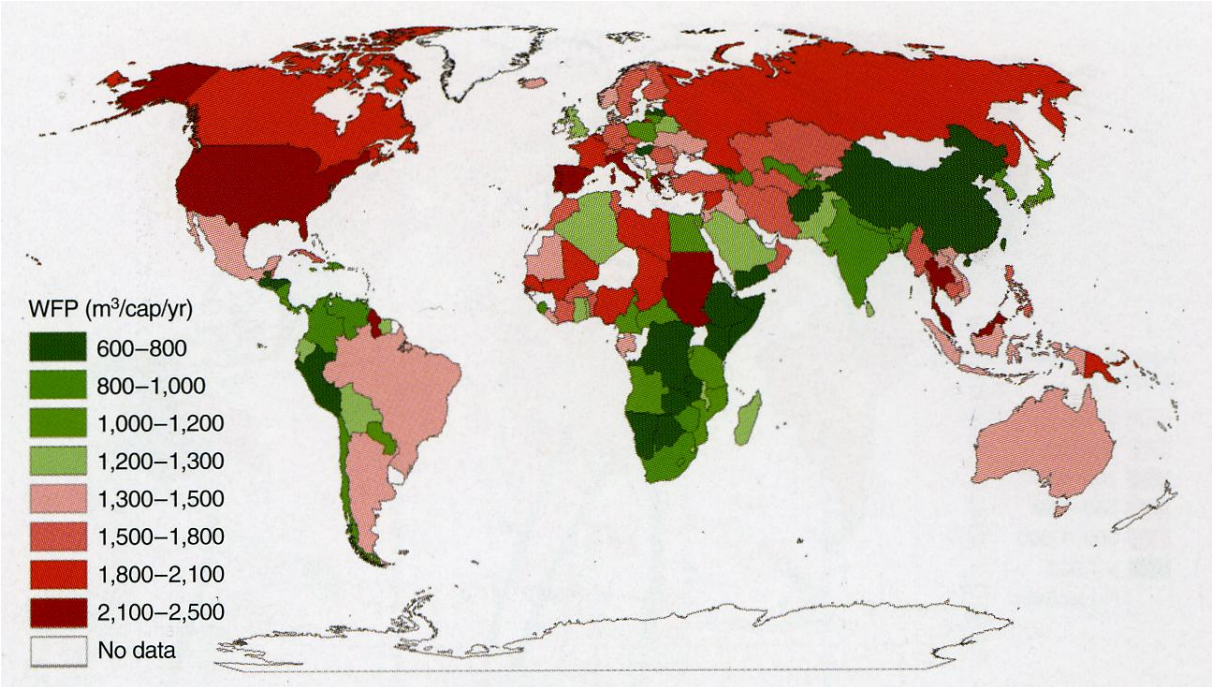


Figure 1.2: Average water footprint per capita per country (source: Hoekstra & Chapagain, 2008)

[1] The term "water footprint" is precisely explained in Section 2.2.

Figure 1.3 *left* illustrates that people in the U.S. have the largest water footprint, which is equal to 2,480 m^3/cap/y and 6,795 liters per day per person. They are followed by people in the southern of EU, such as Greece, Italy, and Spain (2,300 to 2,400 m^3/cap/y). Large water footprint per capita over the global average water footprint can also be found in Thailand, which is equal to 2,223 m^3/cap/y and 6,090 liters per day per person, followed by Nigeria (1,979 m^3/cap/y) and Russia (1,858 m^3/cap/y). The size of the global water footprint is largely determined by the consumption of food and other agricultural products. Figure 1.3 *right* shows that water footprint related to consumption of agricultural goods is equivalent to 85.8%, whereas water footprint related to consumption of industrial goods and domestic water consumption equal 9.6% and 4.6% respectively. The total volume of water used globally for crop production is 6,400 billion m^3/y at field level, and rice has the largest share. It consumes about 1,360 billion m^3/y, which is equal to 21% of the total water used for crop production at field level (Hoekstra & Chapagain, 2008).

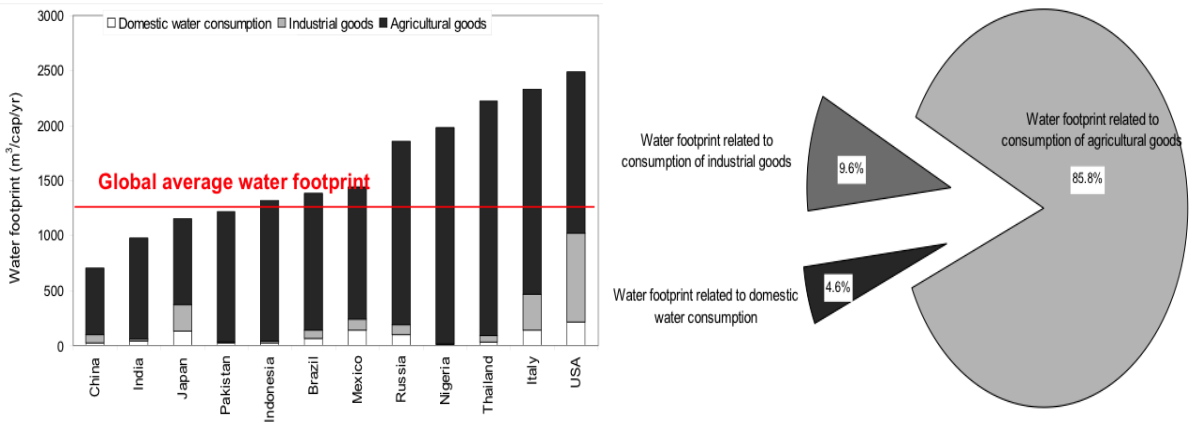


Figure 1.3: *left* Average water footprint per year per capita of selected countries *right* Global water footprint contributed by consumption category (source: Hoekstra & Chapagain, 2008)

In developed countries, people generally consume more goods and services, which immediately translates into larger water footprints. This can be seen in the case of U.S. and Italy. In the U.S., the consumption of meat, in particularly beef, contributes to a large water footprint. Average consumption of meat in the U.S. is 120 kg/y, which is more than three times the world average. In regions with a high evaporative demand due to their climatic conditions, the water requirement per unit of crop production is relatively large. Inefficient water use increases water use in production as is evident in countries such as Thailand, Cambodia, and Nigeria. In Thailand, rice yields averaged 2.5 ton/ha in the period 1997-2001, while the global average in the same period was 3.9 ton/ha (Hoekstra & Chapagain, 2008). This implies that Thailand can and should improve the way it produces its rice crop in order to increase the yield per hectare and reduce water consumption. As a result, the development of sound irrigated agriculture plays a major role in escalating agricultural yields and outputs in order to feed the world's growing population and in avoiding water scarcity (cf. Orr et al., 2009).

In many developing countries it is a combination of unfavorable climatic conditions and poor agricultural practice that contributes to a large water footprint. This is the case with Thailand. Fundamental factors that are conducive to poor agricultural practice and thus large water

footprints are the lack of proper water pricing, the presence of subsidies, the use of water-inefficient technology, and lack of awareness among farmers of simple water-saving measures (Hoekstra & Chapagain, 2008). According to past experience, inappropriate water management may lead not only to a lack of water security, e.g. poorly-planned water infrastructure, but also to unfavorable environmental outcomes, including excessive groundwater resource depletion, pollution of freshwater resources, water logging,[2] and salinization of formerly productive crop areas. Poor water management practices are often encouraged by subsidies from governments and distorted incentives (cf. Ringler, 2010; Orr et al., 2009).

The United Nations (2003) describes water scarcity as, "The point at which the aggregate impact of all users impinges upon the supply or quality of water under prevailing institution arrangements to the extent that the demand by all sectors, including the environment, cannot be satisfied fully." Influential voices in the global economy are increasingly talking about water-related risk as an emerging threat to businesses. Water sustains industry, and thus the global economy. Freshwater is the essential ingredient in many products and perhaps the most important natural resource for human survival. It could be said without exaggeration that our economy runs on water, and that economy is increasingly at risk (cf. Ceres, 2010; Tschochohei, 2008). As businesses seek to secure long-term prosperity, maintain competitive advantage and brand differentiation, and secure stability and choice in supply chains, increasing water scarcity presents physical, financial, regulatory, reputation, and other risks (cf. Orr et al., 2009). In recent years, news stories of droughts in the U.S., eastern Australia, India, and northern China have dominated the newspaper headlines. Economic growth in the western U.S. is slowing due to reduced water supplies from melting snowcaps and ongoing drought (Ceres, 2010). These water-related risks are mentioned in Section 4. The type of businesses in a given area will determine the level and exposure to water-related risk and the appropriate response. Heavily water-dependent businesses will face challenges and uncertainty owing to the increasing scarcity of water (Orr et al., 2009).

1.2 Purpose of Research

This research aims to develop the "Product Water Footprint Label (PWFL)" as a market-driver instrument that would motivate businesses in the food and beverage sector to minimize water consumption throughout their supply chain. As a result, alternative water management approaches and technologies would be implemented in order to maintain or create business competitive advantages and ensure long-term cost effectiveness regarding water resources, which would lead to sustainable use of water resources.

[2] In agriculture, various crops need air (specifically, oxygen) to a greater or lesser depth in the soil. Water logging of the soil stops air from getting in. It refers to the saturation of soil with water. Soil may be regarded as water-logged when the water table of the groundwater is too high to conveniently permit an anticipated activity.

1.3 Research Questions

Main question

How can product water footprint labeling induce sustainable use of water resources in the food and beverage sector?

Relevant questions

1. Recent market and consumer behavior studies show that consumers tend to buy more eco-products today than they did in the past because they are aware of environmental issues and would like to support eco-friendly producers in order to reduce negative effects on nature. Will consumers do the same thing in the context of water scarcity by choosing products with low water footprints over similar products that contain higher water footprints?

2. What is the role of stakeholders, which include farmers, exporting businesses, international retailers, international non-governmental organizations (NGOs), governments of developing countries, and worldwide consumers in supporting PWFL?

3. How can businesses in the food and beverage sector benefit from transparency in water use in the production processes by launching PWFL products?

1.4 Scope of Research and Limitations

As mentioned earlier, this research attempts to propose PWFL as a market-driver instrument in order to motivate businesses in the food and beverage sector to improve their production processes to use less water than earlier or current processes. As a result, sustainable effects derived from the label are analyzed in two core areas using various methods. First, empirical evidence from Thailand with regard to the current market situation of the food and beverage sector is gathered by interviewing a representative from the business sector and a governmental organization. Consumer behavior, purchase decisions, and perceptions of PWFL are analyzed by conducting both internet-based and paper-based survey questionnaires. These findings are applied to explore the possibility of launching PWFL in Thailand in the near future. Second, the research tries to assess whether PWFL could be used to label exported products in order to create sustainable use of water resources. Answers to this question rely on bibliography and the author's own judgment.

This research will mention the main idea of the water footprint concept and the concept of a product water footprint in order to draw a picture of the water footprint to readers. To gain information about the possibility of implementing water footprint accounting in businesses and initiating PWFL, two in-depth expert-interviews, a short conversation with the creator of the water footprint concept, and open question forms are used. However, an in-depth analysis of the science behind calculation methods of the water footprint of a product is not includ-

ed. Using less water in production processes requires sound technologies and better water management. Today, some companies in the food and beverage sector have already implemented such technologies or are going to integrate them into their production processes in the near future. Some successful practices of water management will be addressed briefly in order to distribute practical and useful methods to businesses, and at the same time, to encourage them to enhance their production processes in terms of a more sustainable water consumption process.

In conclusion, the author would like to focus mainly on market drivers, economic outcomes, and the role of stakeholders, especially businesses, in inducing positive effects on the environment, which would likely lead to the sustainable use of water resources.

Limitations of the research are attributable to the small amount of scientific literature available due to the recent birth of the water footprint concept as well as sustainability labeling. The methods mentioned above also serve to compensate for this literature gap and to assess opinions and eventual initiatives in practice.

1.5 Research Methodology

This research is conducted through a number of steps. First, a review of the literature is conducted to assess the current situation about water issues and eco-products in the global market. Second, a preliminary version of the PWFL used in the survey questionnaire is designed. Third, methodological triangulation is implemented.

1.5.1 Literature Reviews

Relevant literature in the area of sustainable management, water resources, water footprint, product labeling, interview and questionnaire methodology, and basic statistical theory is applied in this research. All reference books are published in conventional form as well as in electronic form in different languages including English, German and Thai.

1.5.2 Design of a Preliminary Version of the Product Water Footprint Label

Carbon footprint labeling is considered a prototype of PWFL. As a consequence, designing a preliminary version of the PWFL requires an understanding of the advantages and disadvantages of various carbon labels available on the market. As explained by Walter and Schmidt (2008), carbon labeling can be classified into five types: “Low” Carbon Label, Carbon Intensity Label, Carbon Rating Label, Carbon Reduction Label, and Carbon “Neutral” Label (see Table 1.1).

Carbon Label	Core message	Central information
"Low" Carbon Label	Unique Selling Proposition[3] (USP) regarding climate protection activities and carbon management	Life-cycle emissions of a product
Carbon Intensity Label	An invitation to compare emission intensity with competitors' products	Life-cycle emission intensity of a product
Carbon Rating Label	An invitation to purchase the highest-ranking products	Valuation result of rating based on emission intensity
Carbon Reduction Label	Contributing to global and national emission reduction goals	Life-cycle emissions of a product and guarantee emission reduction
Carbon "Neutral" Label	Purchasing of a climate-neutral product	-

Table 1.1: Classification of carbon labels with regard to their core message and their central information (source: Walter & Schmidt, 2008)

The *"Low" Carbon Label* communicates the USP of the product through absolute life-cycle emissions. The label manifests that the company is better than its competitors in terms of product-related emissions or corporate responsibility by setting climate policy reduction targets. However, absolute emission figures are difficult for consumers to verify and a competitor can easily follow. In order to compare product-related emissions with those of competitors, emission intensity (emission per unit, e.g. weight or price) is inevitable. If the *Carbon Intensity Label* is applied, in a widespread manner, it will offer a chance to compare emissions per unit among products, because it displays absolute emissions of a product per unit. Basically, companies do not have an incentive to apply for this label because their products' emission intensity must be compared with the emission intensity of the best-in-class products, and this measure often leads to negative consumer perception about a product. The *Carbon Rating Label* proffers consumers a product valuation result in three rankings: gold, silver, and platinum, enabling them to make quick decisions about which products to buy, without considering emissions of competitors' product. The Carbon Rating Label differs from the Carbon Intensity Label in that emission intensities of the labeled product have already been compared with either the Best-Practice-Standard or the average emission intensities of products in the same category. The *Carbon Reduction Label* provides life-cycle emissions of a product within one limited period. It also guarantees emission reduction in the future because a prerequisite for obtaining the label is compliance to a "reduce or lose" clause. A company will lose its right to label its product, if it cannot achieve the emission reduction goal within two years. Carbon Offsetting and carbon compensation measures are excluded from the Carbon Rating Label and the Carbon Reduction Label to enable comparisons among products in the market. The *Carbon "Neutral" Label* relinquishes indications of absolute life-cycle emissions, emission intensity, and emission reduction goals. Its core message is that consumers are contributing to a reduction in global greenhouse gas concentration in the atmosphere by purchasing the labeled product.

After evaluation of the strengths and weaknesses of the five carbon labels mentioned above, characteristics of the Carbon Reduction Label are the most suitable for PWFL owing to several facts. First, analogous to the "Low" Carbon Label, manifesting solely absolute figures of the water footprint of a product conveys nothing to recipients. Second, calculating the water

[3] The factor or consideration presented by a seller as the reason that one product or service is different from and better than that of the competition.

footprint of a product is currently not widespread. As a result, a company interested in labeling their products with PWFL will be a pioneer and the first mover of the market. With regard to these reasons, it is unfeasible to find the best-in-class products as well as to rate them with three rankings; however, global average water footprints of various products are available. Third, the “reduce or lose” clause conforms to the main ideas of the PWFL, which are discussed further in Section 2.3. Last, in contrast to the carbon footprint, concepts of water footprint neutralization and water offsetting are still ambiguous and beyond the scope of research.

Six preliminary versions of the PWFL are designed and used in both internet- and paper-based survey questionnaires. They are also in two in-depth expert-interviews. The preliminary versions consist of two cores, the logo and the format of PWFL. There are two kinds of logos: the earth in a water drop and an image of a water footprint. The first logo seeks to inform consumers that a labeled product saves water resources and is good for the earth, whereas the second logo directly symbolizes the definition of water footprint. Formats of PWFL can be divided into three categories. The first format, which shows the numerical value of the water footprint of a product and the average global water footprint, enables consumers to easily understand how much water was used in order to produce a kilogram of the product and to compare this figure with the global average water use. The second format aims to convey only the reduction in water used in production of a product in comparison with the global average water consumed. As a result, consumers can instantly interpret how much water was saved. The percentage reduction in the water footprint of a product represents the third format of PWFL, which aims to inform recipients that this product reserves X% of water when compared to other products in the same range.

A		The absolute amount of the water footprint (3,000 l/kg) of a product is displayed, together with the absolute amount of the average global water footprint (3,400 l/kg) of the same product on an image of the earth in a water drop.
B		The absolute amount of the water footprint (3,000 l/kg) of a product is displayed, together with the absolute amount of the average global water footprint (3,400 l/kg) of the same product on an image of a water footprint.
C		The absolute amount of the reduced water footprint (400 l/kg) of a product with a minus sign (-) is displayed, together with the absolute amount of the average global water footprint (3,400 l/kg) of the same product on an image of the earth in a water drop.
D		The absolute amount of the reduced water footprint (400 l/kg) of a product with a minus sign (-) is displayed, together with the absolute amount of the average global water footprint (3,400 l/kg) of the same product on an image of a water footprint.
E		The percentage of reduced water footprint (11.8%) of a product with a minus sign (-) is displayed on an image of the earth in a water drop.
F		The percentage of reduced water footprint (11.8%) of a product with a minus sign (-) is displayed on an image of a water footprint.

1.5.3 Methodological Triangulation

Survey questionnaires, open questions, a short conversation, and in-depth expert-interviews are adopted in this research in order to assess the feasibility of product water footprint labeling in general and the behavior of stakeholders in Thailand.

1.5.3.1 Survey Questionnaire

The survey questionnaire is divided into five different sections.[4] The first section deals mainly with the format of the PWFL and consumer willingness to pay for lower water consuming versions of products, such as eggs, milk, rice, and chicken meat. The second section is dedicated to water resources: awareness of water scarcity; links between food and water; awareness of water problems in Thailand; impact of water problems; causes of water problems; and the role of respondents in water problems. The PWFL plays a role in the third section. Questions in this section are concerned with awareness of the eco-label, perception of the PWFL regarding basic information provided, and trustworthiness of the label. The role of consumers in supporting product water footprint labeling is in the fourth section of the survey questionnaire, which contains questions regarding: general purchasing behavior of food and beverage products, influence of consumers on producers, and the role of the consumer in promoting the PWFL. General information of respondents is asked in the last section, and a box is provided for further comments and/or suggestions. The distribution methodology of the survey questionnaire uses both internet- and paper-based surveys. Due to the recent birth of the water footprint concept, it is necessary to provide respondents with some rudimentary information (see Figure 1.4), like a basic definition of the water footprint of a product, at the beginning of both surveys. This is done through a YouTube clip for the internet-based survey, and through a written summary for the paper-based survey.

Figure 1.4: A YouTube clip and summarized text (source: compiled by the author)

The internet-based survey requires approximately 25-30 minutes to complete, which includes 9:16 minutes for watching the clip and about 15-20 minutes for filling in the survey. The data was collected during the winter of 2011, between February 8 and March 29. Beginning on February 8, links to the survey were embedded in:

[4] For more detail see Annex 1 Section 1.1.

1. Bloggang (Thailand) http://www.bloggang.com/mainblog.php?id=waterfootprintlabel;
2. Facebook (worldwide) http://www.facebook.com/profile.php?id=100001790483935;
3. Larndham (Thailand)

http://larndham.org/index.php?/topic/41115-*รบกวนชาวลานธรรมแสดงความคิดเ*/page__p__751368__fromsearch__1&#entry751368;

4. Pantip (Thailand)

http://www.pantip.com/cafe/silom/topic/B10227370/B10227370.html; and

5. YouTube (worldwide)

http://www.youtube.com/watch?v=pJXLpYyngnI.

The paper-based survey questionnaire contains 13 pages of A4 and is presented in black and white format. Approximately 15-20 minutes are needed for completing the form. Questionnaires were distributed at different public places in Bangkok on March 5-9, 2011.

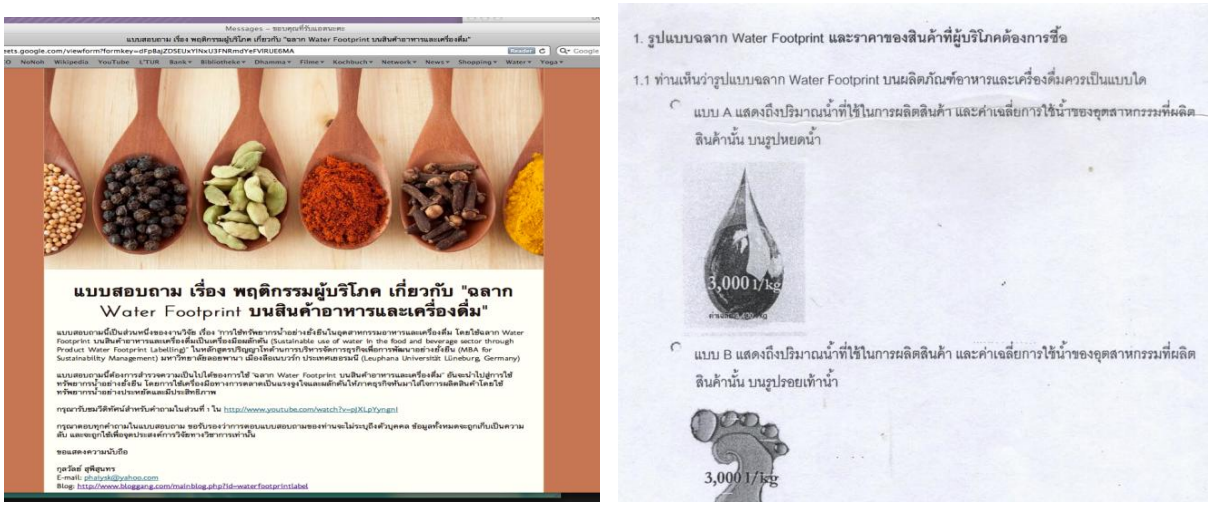


Figure 1.5: *left* Internet-based survey questionnaire *right* Paper-based survey questionnaire (source: compiled by the author)

The population of interest for this study was all Thai consumers, and the sample of this survey was 135 Thai consumers, who can be divided into two groups with regard to access to the survey questionnaire. 85 Thai consumers participated in the internet-based survey questionnaire, and 50 Thai consumers participated in the paper-based survey questionnaire. The statistic of this sample was individuals under 64 years old, with at least a secondary school education. The data has been analyzed using SPSS[5] 18 for Mac OS X in order to find frequency and percent of focused data. Cross-tabulation was adopted parallel to the chi-square test of association and was applied to determine whether there was an association between two categorical variables. The results of the survey questionnaire and its limitations are presented in Section 3.

[5] SPSS (Statistical Package for the Social Sciences) is a computer program used for statistical analysis.

1.5.3.2 Open Questions

Open questions were created to gain in-depth information from experts and used as a substitute for in-depth expert-interviews. Dr. Maite M. Aldaya is a water footprint researcher and works as a consultant for the United Nations Environment Programme (UNEP) in Paris. She has collaborated on the first water footprint assessment manual and conducted much research regarding the water footprint concept. She provided useful information about the water footprint concept by completing a form, which was sent to her via e-mail on March 18, 2011, and received back on April 15, 2011. Questions are related to the following subjects: water footprint accounting, product water footprint labeling, and the end effect of the PWFL. Dr. Erika Zarate Torres is a water footprint researcher for the Water Footprint Network (WFN). She gave her opinion about the role of government and the WFN in supporting product water footprint labeling, as well as the ultimate effect of the PWFL, which was received via e-mail on May 17, 2011. The response of these two experts complements each other in terms of different points of view from two organizations. The results of the open questions for Dr. Aldaya are written in Sections 2.2.1, 2.3.5, 2.4.2, 4.1.1, 4.3, 4.6, 4.7, 4.9, and 6.1.1, and the results of the open question for Dr. Zarate are provided in Sections 2.4.2, 5.3, and 5.4.

1.5.3.3 A Short Conversation

On May 11, 2011, the author had a brief conversation with Professor Arjen Y. Hoekstra, the creator of the water footprint concept, about the format of the PWFL as well as the end effect of the PWFL with regard to preservation of water resources and food security in Amsterdam, the Netherlands. His valuable information is recounted in Sections 2.3.4, 2.3.5, and 2.4.4.

1.5.3.4 In-depth Expert-interviews

Two experts were selected for their experience with the food industry and carbon labeling and its marketing. The first interview was conducted with Mrs. Kularb Kimsri on March 10, 2011 at The Ramada Plaza Hotel in Budapest and took 68 minutes. Mrs. Kimsri works as the Assistant Vice President for Charoen Pokphand Foods Public Company Limited (CPF)[6]. CPF produces food and has its own value chain, which is feed, breed, farm, and food. It also produces animal feed for its own farms, which raise chicken, duck, swine, shrimp, and fish. According to its annual report for 2010, total revenue was 165,063 million Baht (ca. 5,447 million U.S. dollars) and net profit was 10,190 million Baht (ca. 336 million U.S. dollars). CPF is the biggest food producer in Thailand and has no competitor in that nation. Currently, its animal feed production is the largest in the world, so its goal is to compete in the global market. Mrs. Kimsri's first task in CPF was to improve production processes to meet international standards such as ISO[7] standards, and HACCP[8]. CPF has been in accordance with ISO 9001 since 1996, and with ISO 14001 since 1998. After CPF was certified by ISO and several other standards, it started to look at environmental issues. Mrs. Kimsri implemented Environmental Management Accounting (EMA) as a tool to continuously improve the company's

[6] http://www.cpfworldwide.com/index_en.aspx
[7] International Organization for Standardization is the world's largest developer and publisher of International Standards. ISO is a non-governmental organization that forms a bridge between the public and private sectors.
[8] Hazard Analysis Critical Control Point is a systematic preventive approach to food safety and pharmaceutical safety that addresses physical, chemical, and biological hazards as a means of prevention.

environmental management. A project has been implemented by the EU, which supports CPF in joining the carbon footprint project as a pilot company. After that, Thailand also initiated a carbon footprint project, and CPF again participated in this project with support from the Thailand Greenhouse Gas Management Organization (TGO)[9].

To conclude, she has engaged in quality control and environmental issues for more than 10 years and she will be a member of the group that makes the decision whether or not to adopt product water footprint labeling. Interview questions focused on the following aspects: business motivation for using the PWFL, current eco-labeled products of CPF, implementation of water footprint accounting in production processes, launching PWFL products, communication methods with stakeholders, and the end effect of the PWFL. Findings from her interviews are explicated in Sections 2.4.2, 3.3.1, 4.1.1, 4.3, 4.7, 4.8.1, 5.1, 5.2, 6.1.1, and 6.1.2.

The second interviewee was Dr. Pongvipa Lohsomboon, Director of the Carbon Label Marketing Department for TGO, a public non-profit organization that is fully funded by the Thai government. She was interviewed via telephone on March 14, 2011 for 37 minutes. TGO is a newly established (about two years old) autonomous governmental organization, charged with greenhouse gas (GHG) emission reduction in Thailand. In other words, TGO is the delegation of Thailand in promoting low carbon activities, investment and marketing on GHG emission reductions, establishing a GHG information centre, reviewing the Clean Development Mechanism (CDM)[10] projects for approval, providing capacity development and outreach for CDM stakeholders, promoting low carbon activities, and particularly performing its role as the Designated National Authority for the CDM (DNA-CDM) office in Thailand. In 2008, TGO and the National Metal and Materials Technology Center (MTEC)[11] decided to work together to launch the carbon footprint labeling project in Thailand. Dr. Lohsomboon is not only a pioneer in environmental labeling since its inception, but also the initiator of the carbon label project in Thailand. She has developed the National Guidelines on Product Carbon Footprinting by gathering Life-Cycle-Assessment (LCA) experts and recruiting volunteer pilot factories for this project.

In conclusion, Dr. Lohsomboon can provide information about the likelihood of the PWFL's success in Thailand based on her experience with eco-labeling and its marketing. The interview covered the following topics: current situation of carbon labeling in Thailand, marketing strategy of water footprint labeling, communication methods with stakeholders, and the end effect of the PWFL. Findings from her interviews are explicated in Sections 2.4.2, 3.1, 3.3.1, 4.3, 4.9, 4.10, 5.2, 5.4, 6.1.1, and 6.1.2.

[9] http://www.tgo.or.th/english/

[10] The Clean Development Mechanism (CDM), defined in Article 12 of the Protocol allows a country with an emission-reduction or emission-limitation commitment under the Kyoto Protocol (Annex B Party) to implement an emission-reduction project in developing countries. Such projects can earn saleable certified emission reduction (CER) credits, each equivalent to one ton of CO_2, which can be counted towards meeting Kyoto targets.

[11] The National Metal and Materials Technology Center (MTEC) was established by a Cabinet Resolution on September 16, 1986 as a project under the Office of the Permanent-Secretary of the then Ministry of Science and Technology. Its main objective is to support research and development in metals and materials, which are instrumental in the growth of the industrial sector and the overall development of the country.

2. WATER, WATER FOOTPRINT, PRODUCT WATER FOOTPRINT LABELING, AND SUSTAINABLE EFFECTS ON WATER RESOURCES

2.1 Water Resources in Thailand

Though most of Thailand's residents perceive their country as a land of water, this does not mean that there is neither water scarcity nor water pollution. Thailand is situated in the center of the Southeast Asian mainland and has three types of climate (see Table 2.1). A savanna-type climate, with low rainfall and a distinct dry winter season, covers 83% of the total land. The Southeast and upper southern regions experience a tropical monsoon climate, with heavy annual rainfall and a short dry season. The lower southern region enjoys a tropical rainforest climate, with high humidity throughout the year and no month with less than 61 millimeters of rainfall (United Nations ESCAP, 2002).

Location	Between latitudes 20°28' and 5°36' North and longitudes 97°22' and 105°38' East
Average rainfall	Between 1,200-1,370 mm (highest in the southern region and lowest in the northern region)
Summer monsoon (South-west)	May-October
Winter monsoon (North-east)	November-May
Bengal cyclone (South-west)	May-June
Local storms	March-April
Typhoon (South-west)	July-November
Average temperature	23.7-32.5 degrees Celsius

Table 2.1: Thailand location and climate (source: United Nations ESCAP, 2002)

In the 1990s, the annual demand for water in Thailand was estimated at approximately 43,000 million m^3, which included 2,000 million for consumption, 1,000 million for industry, and 40,000 million for agriculture (United Nations ESCAP, 2002). This data indicates that the agricultural sector demands and might consume more than 90% of national water resources. In 2001, however, total water demand for Thailand was approximately 67,000 million m^3 annually (see Table 2.2), which is greater than the 1990s' estimate (43,000 million m^3) by 24,000 million m^3. According to the Thailand Development and Research Institute (TDRI), only 49,500 million m^3 of water storage capacity is available for use. Although this might indicate an imbalance between water supply and demand, the calculation of water supply does not include the water return flow, which has been reused in the lower basin. In the very dry years, water shortage occurred during the dry season. Table 2.2 illustrates the forecasted water demand for the next 20 years, which will be about double the demand in 2001, especially in the agricultural and industrial sectors. The majority of water in Thailand, about 62%, has been used by the agricultural sector, primarily in rice farming. Ecological requirements[12] have consumed the next largest share at 33%, while domestic users, and industry and tour-

[12] The unused rainwater in agricultural production is left to sustain natural vegetation and the groundwater and surface water flows, which are not evaporated for human purposes or polluted, are left to sustain healthy aquatic ecosystems.

ism consumed only 4% and 2% respectively (cf. Doppler et al., 2009). The United Nations Development Programme (UNDP)[13] (2006) reported that competition among users is increasing in intensity in Thailand. Agricultural producers in the Mae Taeng[14] irrigation system are protesting the transfer of water to Chiang Mai, where municipal authorities are struggling to cope with the rising demand of urban and industrial users.

	Water use 2001		Forecasted demand 2021	
Water use groups	Mio cubic meters	Percent	Mio cubic meters	Percent
Irrigation & power generation/agricultural use	41,465	61.7	97,904	77.5
Ecological requirements	22,089	32.9	22,089	17.5
Domestic use	2,363	3.5	2,753	2.2
Industrial & tourism use	1,316	2.0	3,533	2.8
	67,233	100.0	126,279	100.0

Table 2.2: Water use by sector in 2001 and forecasted water demand in 2021, Thailand (source: NESDB[15], 2004; Department of Water Resources, 2005a)

During the last decade, water use for agricultural irrigation grew at an annual rate of 1.6%. The total irrigated area is 52,480 million m^2,[16] which includes 25% of Thailand's agricultural area. Most of the irrigated area is in the Central Plain (45% of the total irrigated area), followed by the North (26%), the Northeast (17%), and the South (12%) (cf. Doppler et al., 2009). The water supply in Thailand is determined by the monsoon climate. The average annual rainfall is approximated at 1,424 millimeters, with a range between 800 and 4,400 millimeters. The amount of rainfall was gauged at 719,500 million m^3 annually. Approximately 70% (506,000 million m^3) is lost due to evaporation and percolation. Only 213,500 million m^3 are maintained in 25 river basins or in underground water sources available for usage, which finally drain directly to the sea or to the Mae Khong River (cf. Doppler et al., 2009; United Nations ESCAP, 2002).

[13] The United Nations Development Programme (UNDP) is the United Nations' global development network. It advocates for change and connects countries to knowledge, experience and resources to help people build a better life.
[14] Mae Taeng is a district in the northern part of Chiang Mai Province in northern Thailand.
[15] The National Economic and Social Development Board of Thailand
[16] Approximately 32.8 million rai and 1 rai is equal to 1,600 m^2

Year	Annual average runoff (Million cubic meters)	Population (Million)	Runoff per capita (Cubic meters)
1997	180,282	60.82	2,964
1998	213,311	61.47	3,470
1999	235,330	61.66	3,817
2000	233,266	61.88	3,770
	203,678	62.31	3,269

Table 2.3: Water runoff per capita, Thailand, period 1997-2001 (source: Royal Irrigation Department)

Table 2.3 displays that the runoff per capita ranges from 3,000-3,800 m^3/y, which includes 86% in the wet season and 14% in the dry season. This indicates that at the national level, Thailand has no water problem based on the international standard. But in regions like Chao Phraya and Thachin basins, the runoff per capita is less than 1,700 m^3 (cf. Doppler et al., 2009).

Owing to large-, medium-, and small-scale water resource development projects, current water storage capacity is about 73,000 million m^3 (see Table 2.4), meaning that Thailand can harvest about 30-36% of the total runoff water. About 70% of the country's water storage capacity, or 49,500 million m^3, are manageable for utilization, due to the 30% minimum requirement for dead storage. Among the 25 watersheds, there is a broad range of storage and runoff ratios, between 0 and 200%. Therefore, at the watershed level, water problems such as water shortage in the dry season or floods in the wet season have been occurring. The potential of groundwater resources in Thailand is estimated at 101,171 million m^3; however, only about 35,000-38,000 million m^3 of rainfall is percolated into the groundwater recharge annually. Approximately 3,175-3,500 million m^3 of groundwater can be withdrawn annually without creating externalities. The largest source of groundwater is found in the lower Central Plain of Thailand (Doppler et al., 2009).

Type of water development projects	Water storage capacity (Million cubic meters/year)	Percent
Large scale	68,041	89
Medium scale	3,347	4
Small scale	1,398	2
Total water storage capacity	**72,786**	**95**
Groundwater	3,500	5
	76,286	**100**

Table 2.4: Surface water and ground storage capacities by type of projects, Thailand, 2005 (source: Department of Water Resources, 2005a)

Irrigation systems lengthen the farming period and allow farmers to regulate water levels with respect to the requirements of their crops. The Thai government has recognized the importance of the irrigation system and has undertaken many irrigation projects. Unfortunately, until now, their performance has been relatively poor as can be seen from following reasons (Doppler et al., 2009). First, there is a separate piece of legislation for managing groundwater. This failure is on the part of the Thai government to recognize the hydrological interconnectivity that shows a continuing hiatus between law and environmental reality. Second, there are separate pieces of legislation governing irrigation. This is problematic since the granting of irrigation licenses should be integrated with the management of the resource as a whole. Third, issues of water quality are dealt with separately under several further pieces of legislation. Water laws in Thailand are thus generally fragmented, overlapping, and lack a coherent framework (Hirsch & Jensen, 2006).

2.2 Water Use for a Product

Comparable to losing oil in an automobile, being down only a few quarts of water can be fatal to a human's life. We need more than drinking water to keep us healthy. Apart from cooking and bathing, water is the most basic element in growing food and in producing clothes and the numerous other goods used in daily life. Traditionally, calculations of how much water is used by a business have been based on the quantities directly consumed in producing products. However, in recent years, businesses have been encouraged to monitor their water use more comprehensively and investigate the water used throughout their supply chains (cf. The Coca-Cola Company, 2010). Freshwater is the primary and most vital ingredient for the beverage sector. Beverage companies' operations are especially vulnerable to risks affecting water availability and quality because the production of soda, juice and alcoholic beverages, whose key raw material inputs include sugar, wheat, hops, corn, grapes and various fruits, is in most cases, water-intensive. In the food industry, water use in agriculture accounts for approximately 70% of water use globally, and in some developing countries it can be as high as 90% (cf. Black et al., 2009; Ceres, 2010). Current evidence shows that water use by the agricultural sector has doubled over the past century due to two central factors. First, global food consumption has increased dramatically since the 1960s, prompted by population growth as well as forced by the Green Revolution[17] and broader use of irrigated agriculture. Second, as economies develop, people tend to consume more meat, which requires up to 10 times more water than cereal to produce the same calorie content (cf. Ceres, 2010). The following paragraphs demonstrate the water footprint concept and its components, which are used to calculate water consumption as well as water pollution caused by manufacturing a product along the supply chain.

[17] Green revolution refers to a series of research, development, and technology transfer initiatives, occurring between 1943 and the late 1970s that increased industrialized agriculture production in India. However, the yield increase has also occurred worldwide.

2.2.1 The Water Footprint Concept

The water footprint is part of a family of footprint concepts. The oldest footprint concept is the ecological footprint introduced in the 1990s, which measures the use of available bio-productive space in hectares. The next famous footprint was the carbon footprint concept, which originated from the ecological footprint discussion and has started to become more widely known since 2005. The water footprint was introduced in the field of water studies in 2002 (Hoekstra et al., 2011). The various 'footprint' concepts are used as complementary indicators of natural capital use relating to human consumption. None of the indicators can be substituted for another, because each one carries specific information, acting as a piece of a jigsaw puzzle in order to complete the big puzzle. As a result, one must bear in mind that adding the water footprint indicator to the dashboard of policy-makers and chief executives is useful, but it does not tell the whole story, which is the same problem inherent in other widely-used environmental, social, and economic indicators (cf. Hoekstra et al., 2011). Observing only area requirements or only water or energy requirements is insufficient to fulfill a holistic goal such as sustainable development. It should be combined with other relevant environmental, social, institutional, cultural, political, and economic insights before making well-informed decisions. Availability of freshwater can be a critical factor in development, but so can land and energy availability (cf. Hoekstra et al., 2011).

The water footprint measures the amount of water consumed and polluted in a certain period, and provides a measure of the amount of available water appropriated by humans, while the remainder is left for nature. The unused rainwater in agricultural production is left to sustain natural vegetation. Correspondingly, the groundwater and surface water flows, which are not evaporated for human purposes or polluted, are left to sustain healthy aquatic ecosystems (cf. Hoekstra et al., 2011). Water footprinting focuses on analyzing freshwater use in view of limited freshwater resources and their pollution, not on the use and pollution of seawater. It does not address other environmental themes such as flooding, climate change, depletion of minerals, fragmentation of habitats, limited land availability or soil degradation, nor does it address social or economic themes such as poverty, lack of access to a proper clean water supply, employment, or welfare (cf. Hoekstra et al., 2011). Since freshwater availability in a catchment is limited, information generated by water footprinting is useful because the green, blue and grey water footprints, explained in Section 2.2.2, show how human activities and products put a claim on these limited freshwater resources. Furthermore, it also broadens the traditional scope of water scarcity analysis by introducing supply chain thinking and including an international trade-related dimension of water scarcity and pollution. In this way, it can contribute to better-informed water-management decisions (cf. Hoekstra et al., 2011).

As mentioned earlier, the water footprint concept was born in the academic arena in 2002; however, it did not enter the world of business, government, and civil society until the second half of 2007. Dr. Aldaya explains that broad interest in the water footprint concept and methodology took off in September of 2007 with a small meeting between representatives from

civil society, business, academia, and the UN. Since then, interest in applying the water footprint concept in governmental policy and corporate strategy has been growing steadily. This led to the establishment of the Water Footprint Network (WFN) on October 16, 2008. A year later, the network had 76 partners drawn from all seven continents and from a diverse assortment of sectors. Two years after the establishment of the WFN, the network had 130 partners. A major challenge is to maintain a shared language in the field of water footprinting, because concrete targets towards sustainable water resource use can only be transparent, meaningful, and effective when formulated in a common terminology and based on a shared calculation methodology. The Spanish national government has been the first to formally embrace the water footprint concept by requiring the analysis of water footprints at the river basin level in the preparation of river basin management plans. Many companies, such as C&A, The Coca Cola Company (TCCC), Concha & Toro, Dole, Natura, Nestlé, PepsiCo, Raisio, SABMiller, Unilever, and UPM Kymenne have already analyzed the water footprint of some of their products, but only a few have reached the stage where they can disclose some of the results. A few studies from the business sector concerning product water footprint have been completed, including beer from SABMiller, cola and orange juice from TCCC, breakfast cereal from Nestlé, and candy and pasta sauce from Mars (cf. Hoekstra et al., 2009). Last but not least, in 2010 Raisio of Finland launched a so-called H_2O label on its Elovena Oat Flakes packaging, which is comparable to the PWFL of this research, also explained in short under Sections 2.3.5 and 2.4.1.3.

2.2.2 Three Categories of Water Footprint

Water footprint builds on the concept of virtual water, which refers to the water embedded in a product. Basically, water is directly consumed in manufacturing operations and indirectly throughout the supply chain (cf. Hoekstra et al., 2009). The water footprint can be classified into three groups as follows:

2.2.2.1 Blue Water Footprint

This refers to consumption of surface and ground water that is evapotranspired, incorporated into a product, returned to a different watershed, or returned during a different time period.

2.2.2.2 Green Water Footprint

Green water is evaporated through crop growth that originates from soil moisture derived from rainfall. This is relevant to agricultural products used in production processes. It is assumed that such a loss is not available immediately to the area downstream of where the crops are grown, and therefore it is considered a water use.

2.2.2.3 Grey Water Footprint

This refers to pollution and is defined as the volume of freshwater that is required to assimilate the load of pollutants, based on existing ambient water quality standards, in order to make the suitable blue water for other downstream uses. For crop production, this would be

the volume of dilution required to reduce leaching from soils of agreed pesticides such as nitrate and phosphate standards to acceptable levels.

The sum of the green and blue water footprints represents the consumptive water footprint, which is unavailable for other users. Grey water results from green or blue water that is not consumed. For instance, when rain (green water) falls on agricultural land and then runs off the field, it may carry eroded soil or chemicals, such as fertilizers, into an adjacent water body, thereby creating grey water. When blue water is extracted from a river, lake or aquifer and used in manufacturing processes, it may be returned to a water body as grey water, containing more or less pollutants than the water that was originally withdrawn. Green, blue and grey water footprints are all represented as water volumes (cf. Hoekstra et al., 2009).

2.2.3 Water Footprint of a Product

The next frequently asked question is how to calculate the water footprint of a product. The water footprint of a product is the volume of freshwater used to manufacture the product measured along the whole supply chain. It evaluates both water consumption and pollution in all steps of the production chain, showing water consumption volumes categorized by sources of water as well as polluted water volumes by type of pollution.

As shown in Figure 2.1, the global average water footprint of a cup of tea (250 ml) is equal to 30 liters, whereas the water footprint of a cup of coffee is 140 liters. It costs about 21,000 liters of water to produce one kilogram of roasted coffee. Assuming that a standard cup of coffee is 125 ml, more than 1,100 drops of water are needed for producing one drop of coffee. For one kilogram of rice, 3,400 liters of water are used. Rice fields in the world consume about 1,350 billion m^3 of water annually, which is 21% of the global water use for crop production. Rice, as harvested from the field (paddy rice), consumes 2,300 liters of water per kg. One kilogram of paddy rice produces 0.67 kg of milled rice on average. In the shop, milled rice is bought in the form of white rice or broken rice, which costs 3,400 liters of water per kg. This total volume of water refers to a mix of rainwater (‘green water’) and irrigation water (‘blue water’). The ratio of blue to green water depends on production circumstances at the place of growth. In China for example, most rice is irrigated, which means a relatively high ratio of blue/green, while in India, irrigation of rice is much less common. One kilogram of chicken meat contains 3,900 liters of water. In an industrial chicken farming system, it takes 10 weeks on average before the chicken is slaughtered, producing 1.7 kg of chicken meat. A chicken consumes about 3.3 kg of grain and 30 liters of water for drinking and servicing the farmhouse. [1]

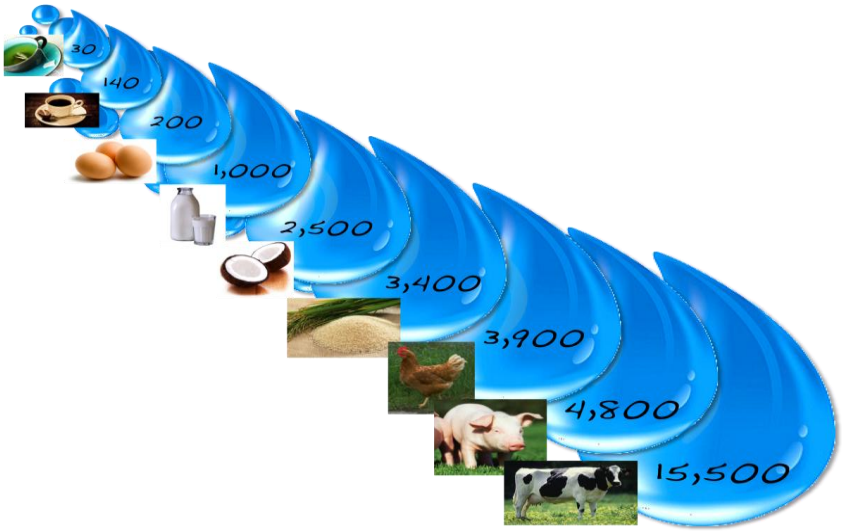


Figure 2.1: Global average water footprints of various products (source: compiled by the author)

It is recognized that water use connected to a product is not limited to its production stage. In the case of many products, such as a washing machine, there is some form of water use involved in the use stage of the product. This component of water use, however, is not part of the product water footprint. The water consumed during product use is included in the water footprint of the consumer[18] of the product. Water footprint of a product is, however, not a measure of the severity of the local environmental impact of water consumption and pollution, since the local environmental impact of a certain amount of water consumption and pollution depends heavily on the vulnerability of the local water system and the number of water consumers and polluters in the same system (cf. Hoekstra et al., 2009). In the case of agricultural products, the water footprint is generally expressed in terms of m^3 per ton or liters per kilogram. In many cases, when agricultural products are countable, the water footprint can be expressed as a water volume per piece. In order to assess the water footprint of a product, one must start understanding the way a product is produced, which means the sequential steps of the production system have to be identified. Because many products require multiple inputs, multiple process steps frequently precede a process step. In such cases, a product tree is needed rather than a linear chain of process steps. A simplified example of a product tree for meat, for example, would include the process of producing feed and all sorts of other inputs, which are necessary in intensive livestock farming, and then the process of raising the animals and finally the process of manufacturing the meat. In some cases, even a product tree is insufficient because more than one final product is produced. For instance, cows can deliver milk as well as meat and leather. Furthermore, in reality, production systems are complex networks of linked processes or even circular. So, the production blueprint of each product must be analyzed and identified, which requires tracing all product ingredients. Clearly, this is not easy to do. Alternatively, some production system diagrams of agricultural products can be found in the Food and Agriculture Organization of the United Nations (FAO)[19] (2003) and Chapagain and Hoekstra (2004) (cf. Hoekstra et al., 2009).

[18] For more detail see in Hoekstra et al., 2011.

[19] The Food and Agriculture Organization of the United Nations (FAO) developed a supra-national classification, also called World Soil Classification, which offers useful generalizations about soil pedogenesis in relation to

2.3 Product Water Footprint Labeling

When consumers have a choice between two or more product alternatives, they will take the offer that promises the highest perceived value. Consumers normally evaluate differences between the total benefits and the total costs of the competing offers. The basic benefit is the function of the product, whereas additional benefits might include self-esteem, recognition and education (cf. Belz, 2005). Eco-labeling is a particular kind of market-based instrument. In contrast to other instruments that basically rely on market dynamics such as taxes, subsidies, quotas, and emission permits, it requires a demand for eco-labels among end consumers or professional buyers who are motivated by environmental or ethical consciousness. End consumers and professional buyers express their willingness and interests through buying eco-friendly products, often paying a price premium (cf. Althammer & Dröge 2006; Boström & Klintman, 2008).

Eco-labeling essentially relies on symbolic differentiation (cf. Althammer & Dröge 2006). An eco-label is a symbol, communicating product attributes and information that are not obvious through the labeled product's sheer visual appearance. In most cases, the attributes are invisible because they are integral to the production process or supply chain behind the product (cf. Boström & Klintman, 2008). Eco-labels can play an important role in helping consumers make more sustainable choices by informing them about labeled products' hidden values (cf. Wales et al., 2010). Many producers, consumers and policymakers understand the positive value of eco-labels and believe that eco-labeling must be a part of the effort for a more sustainable society. Eco-labeling, certified by a third party, translates socio-ecological complexities into a simple, categorical, and trustworthy label (cf. Belz & Peattie, 2009; Boström & Klintman, 2008; Scherhorn, 2002). Effective labeling decreases the cost of searching for information and signals the importance of eco-friendly information (Teisl, 2007).

2.3.1 Reasons for the Initiation of the Product Water Footprint Label

At the European level, in July of 2007, a communication on "Addressing the challenge of water scarcity and droughts in the EU" from the Commission to the European Parliament and the Council recognized that labeling is an effective way to provide targeted information to the public on water performance and on sustainable water management practices (signaling). The marketing of water friendly products should be encouraged by a water efficiency label, which will empower consumers to decide which products to buy to help mitigate and adapt to climate change. Water efficiency and conservation are an absolute necessity for future water security, but if consumers are not aware of the existence of water efficient products, or if they are unable to identify such products because of a lack of information, adaptation to water scarcity will fall short (The Environmental Audit Committee, 2009, cf. Januschke, 2000). Hoekstra et al. (2011), also suggest that water footprint labels can help us cope with water problems in the global dimension. They suggest that water-intensive products, such as rice and sugar cane, should be the first group to apply a water footprint label. In many markets, the introduction of eco-friendly products is obstructed by the problem of asymmetric infor-

interactions with the main soil-forming factors. It was first published in the form of the UNESCO Soil Map of the World (1974). Many of the names offered in that classification are known in many countries and do have similar meanings.

mation or because environmental or social attributes of an eco-friendly product are difficult for consumers to understand, especially in developing countries such as Thailand. If consumers are imperfectly informed about quality, then a company has the incentive to underprovided information in order to minimize costs. As a consequence, consumers are unwilling to pay an environmental premium or social value added even if they are environmentally aware. It can be concluded that differentiation of an eco-friendly product relies on the trustworthiness of an eco-label, which signals the relevant information to consumers (cf. Althammer & Dröge 2006; Kuhn, 2005). In contrast to brands, which are owned and managed by companies, labels are awarded and certified by independent third parties, such as governmental bodies, NGOs, or non-profit organizations (NPOs). If labels are well known and the socio-ecological claims are credible, then they can help convince skeptical consumers and overcome buying barriers (Belz, 2005; cf. Januschke, 2000).

Without the Energy Star label, the U.S. government would not have been able to communicate to its suppliers that it had integrated energy efficiency into public procurement contracts. Similarly, producers of computer monitors would not have been able to communicate to the U.S. government that their products deserved preferential treatment in procurement decisions. IKEA[20] would have a hard time putting its corporate commitment to produce sustainably harvested forest products into operation without a Forest Stewardship Council (FSC) label. The FSC label communicates the public's social expectations to IKEA, and requirements of IKEA to its suppliers. It also helps suppliers communicate their compliance back to IKEA (UNEP, 2005). In this respect, an eco-label is an effective communication tool, not only for raising consumer awareness, but also for communicating expectations and requirements to interested parties. Eco-labels remain one of the most widely accepted methods for a company to communicate environmental and social credentials (cf. UNEP, 2005). The PWFL will serve this same purpose as well.

2.3.2 Purposes of Product Water Footprint Labeling

As a market-based approach to reducing the negative impact of production processes on freshwater resources, product water footprint labeling is applied with the assumption that the purchasing behavior of consumers is not just motivated by price, quality, and health standards, but also by socio-ecological objectives (cf. Browne et al., 2000; Schmid et al., 2005). It is a consumer-oriented approach as well. Product water footprint labeling is one of the eco-labeling practices, which intends to supply information about water used in manufacturing a product to the general public, as well as to provide a market-based incentive for sustainable water management. It is one way to alert consumers that specific courses of action have been taken by businesses to avoid or reduce undesirable environmental production externalities (cf. Busse, 2006). This kind of practice has been recognized under the General Agreement on Tariff and Trade (GATT) administrated by the World Trade Organization (WTO) as an acceptable form of product differentiation based on production processes rather than on

[20] IKEA was founded in 1943. It is a Swedish privately held, international home products company that designs and sells ready-to-assemble furniture such as beds and desks, appliances and home accessories. It is the world's largest furniture retailer.

inherent product characteristics. As a result, the PWFL would make consumers aware of the actual, but thus-far hidden, link between a consumer product and the impact on water systems that occurs during production (cf. Hoekstra et al., 2011; Scherhorn, 2002; Teisl, 2007). Product water footprint labeling will achieve its purpose by influencing change in the purchasing behavior of consumers in a way that creates incentives for businesses to manufacture products with less negative impact on freshwater resources. Those incentives may include a price premium, which reflects consumers' willingness to pay relatively higher prices on the basis of the positive impact on freshwater of products labeled with their water footprints (cf. Carambas, 2005; Nordic Council of Ministers, 2008). At the same time, the PWFL educates consumers about the environmental consequences on freshwater of the product's manufacture, use, and disposal. As a result, consumers might search for water-saving products, which leads to changes in purchasing behavior and ultimately to a reduction in negative environmental effects on freshwater resources (cf. Busse, 2006; Teisl, 2007).

Unlike concerns over exposure to toxic chemicals in everyday products, the PWFL does not directly focus on consumers' health and safety. Rather, it concentrates on identifying and emphasizing the inherent socio-ecological value of a labeled product (cf. Belz & Peattie, 2009). In addition, the PWFL symbolizes that a particular product has a positive quality that substitute products lack and says implicitly that this product is different from other conventional products. This can be an efficient way to differentiate products in the market for food and beverage products that otherwise would appear nearly identical to consumers. It also corresponds to consumer expectations in terms of information and transparency of products (cf. Boström & Klintman, 2008; Nordic Council of Ministers, 2008; Schaltegger et al., 2007). Some may argue that a concentration on only water used in manufacturing food and beverage products is too issue-specific and not yet broadly known. In the view of the UK Sustainable Consumption Roundtable, however, focusing on one issue is crucial in order to reach the goal of product water footprint labeling. Since efforts to create some sort of 'catch all' ecolabeling system are likely to be problematic, mostly because of insufficient information databases, the Roundtable concluded that labels have driven change only when they are designed specifically for a small number of issues closely associated with a particular product and its value chain (cf. Wales et al., 2010).

To conclude, the purpose of the PWFL is threefold: furnishing consumers with the information necessary to make sustainable purchasing decisions, initiating a dialogue in relation to competitors, policymakers and consumers, and driving the market toward the requirements and goals of the PWFL (cf. The Environmental Audit Committee, 2009; Nordic Council of Ministers, 2008). Its ultimate goal is the sustainable use of freshwater in the food and beverage sector, thus accomplishing market transformation. When the market is completely transformed, in theory, a water footprint label will eventually become unnecessary (cf. Boström & Klintman, 2008).

2.3.3 Elements of Product Water Footprint Labeling

Standards and criteria created by a third party or governmental organization are an important component of the product water footprint labeling scheme. Companies who want to attach a PWFL to their products must comply with these standards. In most cases, eco-labeling criteria are basically, but not necessarily, set by a third party and based on certification by that independent third party. After a company is approved and allowed to use an eco-label, it has to maintain its performance in order to keep that eco-label. Its production processes are generally examined annually by an external auditor, who has the authority to require corrective measures and, in the event of continued non-compliance, to withdraw the certification. Most of the criteria and principles are continuously adjusted, improved, and sharpened in response to new knowledge and marketing opportunities (cf. Boström & Klintman, 2008). In addition, processes involved in obtaining an eco-label are often used as part of quality management systems for professional buyers and can be required as a "ticket to trade" (Nordic Council of Ministers, 2008). Since conversion to a water-saver production system is required in order to get the PWFL, there are additional production costs expected apart from certification and inspection costs (cf. Althammer & Dröge 2006; Carambas, 2005). In general, existing literature has emphasized that high costs will be involved in implementing product water footprint labeling. Like other eco-labels, the PWFL does rely on consumers having a certain level of awareness and understanding in order to interpret it. Not surprisingly, price is also a critical factor in determining whether a product goes mainstream. In some cases, consumers are prepared to pay a price premium; however, for a PWFL product to move beyond a relatively niche market, a competitive price is required (cf. Wales et al., 2010).

2.3.4 Courses of Action of Product Water Footprint Labeling

As mentioned above, in order to be certified and allowed to use a PWFL, businesses must analyze their production processes for a particular product and build its production tree from the field to the end product (see Figure 2.2). Next, they must calculate the three kinds of water footprints for their products along the supply chain and prepare the water footprint accounting on the basis of collected data. Water footprint accounting for a product can be classified into three stages, which include crop cultivation, operation in the factory or in-house production, and packaging. Water footprint accounting of the crop cultivation step depends heavily on site-specific data, which can be collected only if other actors, such as farmers or producers and suppliers, in the supply chain are willing to participate in the process of product water footprint labeling. A company has to compare water footprints of its product with an appropriate benchmark, such as regional or global average water use for the same kind of products. Then it must try to find the hot spot of water consumption throughout the supply chain and reduce it as much as possible.

As Professor Hoekstra explains, a benchmark is needed so that consumers can evaluate how well a business is conserving water resources. At first, the benchmark should not be too low or too different from the actual water footprint, so as to offer businesses the incentive and motivation to manage their water use and reach the benchmark goal, which must be revised

every year and set lower than the prior year's goal in order to keep businesses improving continually. Nevertheless, finding an appropriate benchmark that is compatible to all is not easy because the water footprints of the same kinds of products vary from dry season to wet season as well as from land to land. This issue is beyond the scope of this research and absolutely requires further analysis and study. Alternatively, if a company wants to be a pioneer in product water footprint labeling, it can use the product water footprints of its conventional production processes as an initial benchmark instead of the regional or global average, comparing the company's past performance to its current product water footprints, which would reflect the shift to water-friendly production techniques. Before attaching the PWFL on a product, a company has to apply for examination and approval from a third party in order to assure the public of trustworthiness.

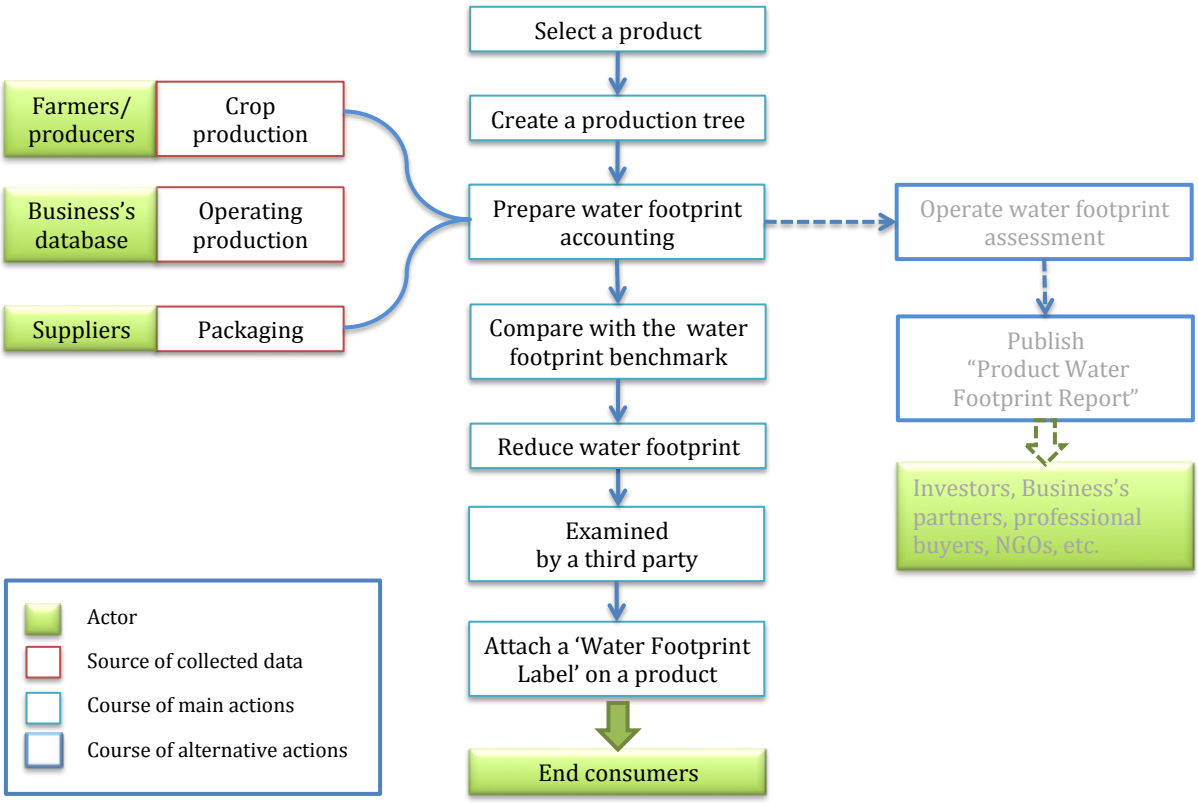


Figure 2.2: Courses of action of product water footprint labeling (source: compiled by the author)

According to Figure 2.2, the PWFL aims to convey information to individual end consumers; however, a company can benefit further from water footprint accounting by expanding to a water footprint assessment.[21] This step allows a company to discover which effects on freshwater resources derived from its production processes are included. This information, along with other risks, can be embedded and carefully considered in a business risk assessment. A company can also publish a product water footprint report, which provides shareholders and other stakeholders such as investors, business partners, professional buyers, and NGOs, useful information regarding freshwater resources and water-related risk. This is another option for communicate to the public that a company has Corporate Social

[21] For more detail see Hoekstra et al., 2011.

Responsibility (CSR) and business transparency. This step unfortunately falls outside the scope of this research.

2.3.5 Information Contained in the Product Water Footprint Label

Too often the market cannot provide consumers information that might influence their purchasing decisions. Eco-labels are supposed to correct these market failures (cf. Belz, 2005). In order to fulfill this goal, an eco-label can neither be complicated nor embody any conflicts. There are many kinds of eco-labels in the market, and it is not always easy to distinguish the similarities and differences among them and to determine whether or not they are compatible. This is particularly true in the case of food labels such as organic or fair trade, and in the recent rapid growth of carbon labels such as CO_2 Neutral, Carbon Reduction Label, air freighted, and carbon offset. Given their space limitations, it is difficult for labels to strike the right balance between information and animation necessary to communicate effectively. If there is too much information on a label, consumers will not read it thoroughly, and they may become confused because of information overload. At the end of the day, it will discourage consumers from caring about the sustainable attributes of a product. Nevertheless, if there is too much animation, the socio-ecological message might be less credible than it should be. Therefore, it is vital to keep an eco-label as simple as possible and to use it to communicate a product's socio-ecological attributes to target consumers (cf. Belz, 2005; The Environmental Audit Committee, 2009; Scherhorn 2002). An important determinant of the success of an eco-label is whether the consumer understands the meaning of the eco-label or has some perception of it regardless of its certification criteria (cf. Teisl, 2007). The PWFL also offers consumers a non-biased, comparable, and relevant figure of water use in manufacturing a product, which enables consumers to choose between products that consume more or less water within the same product segment.

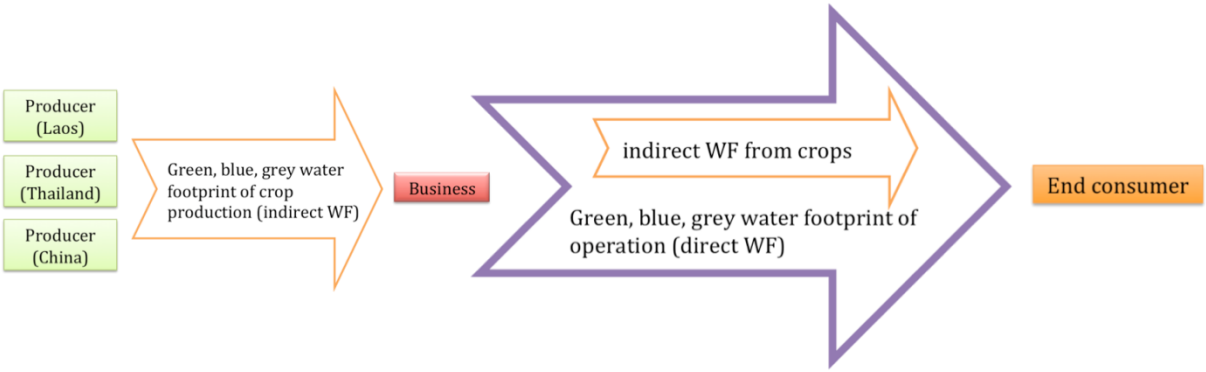


Figure 2.3: Transfer of information on water footprints of a product (source: compiled by the author)

The main criticism of the PWFL is that an aggregated figure is meaningless if it is not related to anything, and consumers cannot understand this type of information. Climate labels provide a good example of this problem. A survey of climate labeled products at Tesco, the leading UK supermarket chain, shows that consumers have a low understanding of the information given by the climate label (cf. Blomqvist, 2009). To overcome such drawbacks, a brief explanation of the label should be included, which might explain such concepts as blue

water use in manufacturing a product and its sources, and grey water needed to assimilate wastewater generated from the process. According to the Environmental Audit Committee (2009), multi-issue labels covering fair trade, pesticides, environmental issues, carbon, or even water on every single one of those products may appear attractive as a "one-size-fits-all" solution. However, in reality, the aggregated nature of their message makes them less effective and distracts both consumers and suppliers. In addition, large datasets are required to prove whether a product meets a wide set of sustainability criteria. Thus, a label works best when it communicates only a single clear issue and responds to consumers' need for information. This prevents further interpretation of the label and empowers consumers to make informed decisions. The PWFL is designed to inform consumers that the product is produced under water-concerned production processes and to give them a snapshot of how much water is consumed and polluted, not only in production processes, but also along the supply chain. Regarding Figure 2.3, the PWFL helps businesses to make their product's supply chain more transparent and to reduce the huge information gap between the first actor of the supply chain and end consumers at the end of the chain (cf. Schumacher, 2010).

The lesson learned from the H_2O label of Raisio is that an aggregated figure does not tell consumers anything about the dimensions of the water footprint, which include green, blue and grey water footprints. On the other hand, to provide consumers absolute information about the production processes' negative impact on water resources requires information from the water footprint assessment, which is beyond the scope of this research (see Figure 2.2). In understanding the negative effects of production, not only the volume of blue water use is critical, but also its sources because small water footprints of blue water used from a likely-drought catchment cause much more severe negative effects than the use of a huge amount of blue water extracted from a water-rich catchment. Therefore, Professor Hoekstra suggests that the PWFL should identify at least two kinds of water footprints and should compare them to some criteria or benchmark in order to provide consumers with meaningful information.

As shown in Figure 2.4, the PWFL will display how much water is used in manufacturing one unit of a product, categorizing water usage into blue and grey water footprints, because these two types generate more negative effects on water resources than green water footprints. Displaying only two types of water footprints may be advantageous because it reduces complexity and makes it easier to communicate with end consumers. As a consequence, an aggregated figure of total water footprints does not appear on the PWFL. Rather, the animation of blue and grey water drops with small figures represented as blue and grey water footprints appear. The PWFL consists of blue and grey water drops, with each drop representing 10 liters of water use.

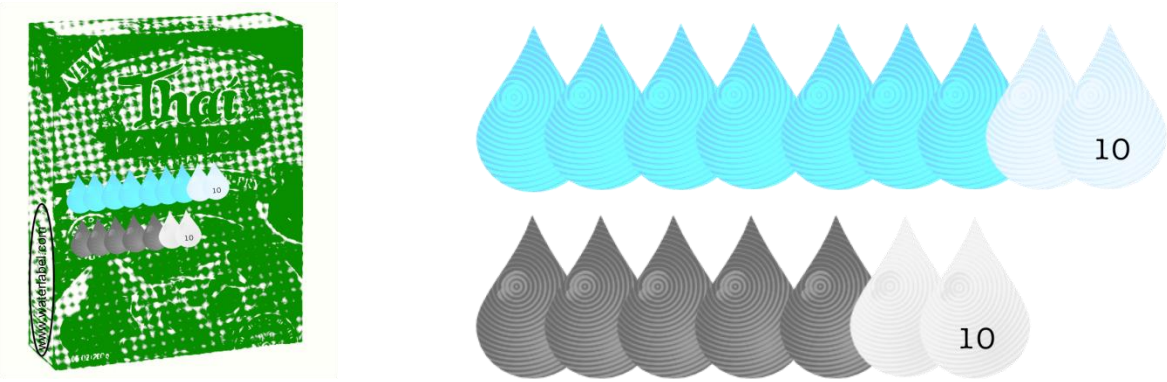


Figure 2.4: Product Water Footprint Label (source: compiled by the author)

This label informs consumers that the product consumed 70 liters of blue water along its supply chain, and that 50 liters of water were polluted due to its production processes. At the same time, it shows that this product uses less water than the average water use of 20 liters of blue water and 20 liters of grey water. This implies that the company generates less negative environmental and social impact due to a reduction in grey water, and that the company creates positive environmental and social effects owing to its saving of blue water. However, the label cannot provide highly specific information about positive or negative effects derived from the product's performance, such as the type of pollution generated. Additionally, it should be noted that the PWFL is a positive marketing tool, which means that only companies with good water footprint reduction results have an incentive to label their products. This is the same principle as the carbon reduction label's scheme because it is based on the "reduce or lose" clause. In the case of the carbon reduction label, a company will lose the right to print the carbon reduction label on its product, if it cannot fulfill the CO_2-emission reduction obligation within two years (Walter & Schmidt, 2008).

Figure 2.5: l*eft* QR code *right* a QR Code on Soup Starters' packaging [2]

Additionally, companies could use the other side of the product packaging to add further information about defined sources of blue water use and locations of grey water release. Another possibility for the provision of more detailed information that cannot be displayed on the packaging itself is the use of Quick Response (QR) codes as shown in Figure 2.5. Such 2D codes can be read with a smart phone's barcode reader application and direct the consumer to a web page, where more information can be found. Pacific Natural Foods, for instance,

features a QR Code on Soup Starters' packaging to inform their customers about how to make quick-and-easy meals.[22] Detailed information about the water footprint of a product will draw consumers a picture of linkages between a product, which is bought in one place, and water use and pollution that occur in other places. It will also identify whether water consumption and pollution are taking place in areas where water is relatively scarce and already polluted beyond acceptable limits[23]. Dr. Aldaya suggests that a more comprehensive water footprint label should be able to indicate whether downstream users or ecosystems are negatively affected and whether the water consumed could have been used for an alternative purpose with a higher societal benefit. Furthermore, she recommends that a more comprehensive PWFL would make it easier for consumers to integrate water footprint labels into broader labels that include issues such as energy and fair trade.

2.3.6 Water Footprint VS Carbon Footprint

While the concepts of water footprint and carbon footprint are similar in terms of the information they provide and the roles they play as indicators, they are totally different in the assessment context. The water footprints derived from water footprint accounting delivers the same message as carbon footprints that show the pressure of human activities on the environment, not the impact of it. In both cases, a supply chain perspective is promoted. The two concepts complement each other, each concept addressing an individual environmental issue. According to Table 2.5, the carbon footprint addresses the issue of climate change, whereas the water footprint relates to the issue of freshwater scarcity.[24] For example, the carbon footprint is a measure of how much greenhouse gases are emitted into the environment as a result of human activities, while the water footprint shows how much water is consumed by a product (cf. Hoekstra et al., 2011). The water footprint deals with both inputs and outputs in the production process. This includes water resource consumption and wastewater. The carbon footprint, on the other hand, addresses a particular output of the production process, carbon emission. Carbon footprinting is comparable among various products. If the same boundaries and methodology are applied, the smaller carbon footprints of a product are, the better the product is in comparison with others. On the contrary, small water footprints of blue water used from a likely-drought catchment cause much more severe negative effects than the use of a huge amount of blue water extracted from a water-rich catchment. For carbon emission, the location of emission is not consequential, whereas the location of water use and pollution is extremely important in assessing environmental impact. A carbon emission in one place can be offset by carbon emission reduction or sequestration in another place. However, this is not true for water because one cannot reduce the local impact of water use in one place by saving water in another place (cf. Hoekstra et al., 2011).

[22] It is known for its award-winning natural and organic food and beverages, puts recipes, cooking demos and easy-to-access shopping lists at consumers' fingertips. [2]
[23] Compare with Annex 2 Section 2.1.
[24] Compare with Annex 2 Section 2.1.

	Water footprint	Carbon footprint
Environmental issues	Freshwater scarcity	Climate change
Input/Output of a product	Input and output	Output
Comparability	Comparable among the same kind of products	Comparable among various products, if the same boundaries and methodology are applied
Scale	Depends on degree of scarcity of watersheds	Smaller is better
Locations	Does matter	Does not matter
Offsetting	Not possible	Possible

Table 2.5: Water footprint VS Carbon footprint (source: compiled by the author)

To conclude, carbon footprints are independent in the context of where they are emitted; however, water is local. Thus, water footprint numbers must be considered in the context of the local watershed. The number derived from water footprint accounting is only the beginning of water footprint application[25] (cf. The Coca-Cola Company, 2010). In order to gain information about the impact of both footprints, further assessments are needed. In the case of water footprinting, one has to conduct water footprint assessment after finishing water footprint accounting.

2.4 Sustainable Effects of Product Water Footprint Labeling

Businesses' incentive to invest in water-saving production technologies depends on consumers' willingness to pay for PWFL products. Willingness to pay, in turn, depends on consumers' ability to internalize the socio-ecological value of the PWFL product. Assuming there is some level of consumer awareness of water scarcity issues, PWFL enable consumers to differentiate products based on their possible impact on water resources. Consumers eventually express their preferences through the quantities they consume and the prices they pay for PWFL and conventional products (cf. Carambas, 2005). It is still unclear whether the eco-labeling strategy is an ineffective means of tackling environmental problems, since eco-labeled products will appear only as small niches, which could not reform entire industries towards sustainable practices. The fact is reforming entire industries must not rely on only one instrument such as eco-labeling. However, eco-labeling could be a factor in helping to promote eco-friendly practice. Eco-labels can be effective because eco-labeled products appear as a top niche within markets and the niche cannot be too small or too detached from mainstream markets (cf. Boström & Klintman, 2008). Since a PWFL program does not exist, the empirical sustainable effects on water resources derived from such a program cannot be found. Instead, hypothetical effects are suggested in the next paragraph, based on sustainable effects generated from other eco-labeling programs, water footprint accounting of pilot companies, and the information provided by experts from various sectors.

[25] For more detail see Hoekstra et al., 2011.

2.4.1 Economic Aspects

Commercial benefits, such as better decision-making, business reputation, competitive advantage, communication along the supply chain, long-run cost-effectiveness, market access, price premium, and water supply security, are incorporated in the economic aspects of the sustainable effects derived from product water footprint labeling. These benefits, at the same time, can be considered business motivation for PWFL; therefore, they are analyzed and discussed in Section 4.

2.4.2 Environment Aspects

The positive environmental impact of eco-labeling on production and consumption is still vague due to the lack of a consistent and definitive body of independent evidence. Virtually no data is available that could be used to quantify the degree of influence that these programs have. The complexity of the system involved and the difficulty of assessing causation, make it very hard to collect this information. It is a task that is perhaps beyond the capacity of any single organization (cf. UNEP, 2005). Some limited evidence, however, has lent support to the presumption that positive environmental effects could result from eco-labels. First, Norway's importation of fine paper originating from Brazil declined significantly after the introduction of an eco-label. Second, a few years after the introduction of the eco-labels for oil and gas heating appliances under the German Blue Angel[26] program, emission of sulfur dioxide, carbon monoxide and nitrogen oxides were reduced by more than 30% (cf. Althammer & Dröge 2006; Teisl, 2007). Third, in the U.S., dolphin-safe tuna products have driven the conventional tuna products out of the supermarket shelves. Finally, the Home Depot[27], a huge and widely admired home improvement retailer, has agreed to give preference to certified wood and to stop buying wood from endangered areas by the end of 2002 (Teisl, 2007).

Currently, there are at least three companies that have calculated the water footprints of their products: TCCC, Nestlé of the Netherlands, and SABMiller. TCCC concluded that water footprinting is helping them refine their approach to global water stewardship. At first, the company is focusing on operational water use by taking action to use water more efficiently and treat all manufacturing wastewater. However, its water footprint accounting has verified the importance of examining direct and indirect water use separately, which caused TCCC to understand the health of watersheds everywhere it operates and to start looking at water use in its supply chain (cf. The Coca-Cola Company, 2010). Dr. Aldaya claims that good information about water footprints will help companies to understand how a more sustainable and equitable use of fresh water can be achieved. This information also shows the link that exists between daily consumption of products and the problems of water depletion and pollution that exist in the regions where products are manufactured. She concludes that PWFL would provide consumers with proper information to make consumption choices, which could ultimately lead to a more sustainable water resource use. Like Dr. Zarate, she is not sure that

[26] The Blue Angel (Blauer Engel) is a German certification for products and services that have environmentally friendly aspects.

[27] Home Depot is an American retailer of home improvement, construction products and services. The Home Depot operates 2,248 big-box format stores across the United States, Canada, Mexico and China.

PWFL can force food and beverage producers to use less water, which would result in more sustainable water resources as well as food security for other stakeholders. Rather, she thinks that PWFL is a powerful awareness-raising tool for all consumers. If consumers have this information, they are better informed to choose the products they prefer (cf. Busse, 2006). All this in turn would force producers to find ways to use less water in their production chains, so they could get the PWFL.

Mrs. Kimsri also comments that the method and format of PWFL can make consumers aware of their impact on the environment, or at least help them imagine what it is all about. She believes that if the PWFL uses the same methods embodied in the carbon label campaign, it is possible that PWFL could compel food and beverage producers to reduce their water use. She assumes that it will perform in the same way as earlier launched labels, such as green labels[28] and No. 5 Energy saving labels.[29] Mrs. Kimsri explains that labeling is a method of creating consumer awareness on one issue. If the process of obtaining a PWFL requires companies to reduce their water footprints, it will force companies to take a look at their water management and find a way to reduce water use in order to compete in the market. Moreover, water footprint accounting covers the entire life cycle of a product, so it will put pressure on all players in the product supply chain. If international retailers were interested in water footprinting, exporting businesses would have no other choice but to implement water footprint accounting in their chains. As a result, water use in every chain would be reduced as much as possible in order to qualify for a PWFL.

According to the Nordic Council of Ministers (2008), environmental standards are rising through consumers' choice. Although TCCC has not launched a PWFL, it concludes that benefits from water footprint accounting are lowering water use not only in production processes but also along the supply chain, which contains the largest portion of the product water footprints. As a result, the company sees significant opportunity to engage more directly with its agricultural suppliers in advancing sustainable water use. The fact that operational water footprints associated with production were found to be a very small percentage of the total water footprints, does not mean that it is absolutely insignificant. Businesses still have to manage their direct or operational impact on local water resources, for example reduction of wastewater released from their production processes (cf. The Coca-Cola Company, 2010). Dr. Lohsomboon believes that if there were a PWFL that producers could procure only by reducing the product's water footprint, it would definitely lead to reduction of water use to some degree, though not throughout a whole industry. With respect to water footprinting, SABMiller realizes that the largest part of its water footprint is derived from crop cultivation. If it wants to reduce its water footprint, it has no other way except to influence its suppliers to adopt farming methods that are more water efficient and to work with local and national governments and regulators to ensure that water resources are managed productively, equitably, and sustainably (cf. SABMiller et al., 2010). Other positive environmental effects could

[28] Green label is an eco-label applied to various products except for medicines, food, and beverage. [3]
[29] The label represents the most energy saving label on electric products in Thailand.

be obtained by reducing water use in the food and beverage sector, which includes improving long-term water stewardship, availability of water resources, the aquatic ecosystems, and global biodiversity.

2.4.3 Social Aspects

Water is the world's most critical resource. More vital than oil, water sustains life and thus the global food chain. Unfortunately, at present, nearly one billion people lack access to clean water (Ceres, 2010; The Coca-Cola Company, 2010; SABMiller et al., 2010). Manufacturing and agriculture depend on cheap and reliable access to clean water, yet the UN projects that by 2025 more than half of the world's population will live in areas of significant water shortages. Despite these trends, water remains under-priced (Rogers et al., 2008; Wales et al., 2010) and overexploited in many parts of the world that will desperately need more water in the coming years to feed their populations, grow their industries and improve their quality of life. As mentioned in Section 1, a significant change in water efficiency around the world is more necessary than ever (Wales et al., 2010).

2.4.3.1 Alteration of Consumer Behavior and the Market

Consumer behavior is key to the impact that society has on the environment. The actions that people take and the choices they make – to consume certain products and services rather than others or to live in certain ways – all have direct and indirect impacts on the environment, as well as on personal and collective well-being (Jackson, 2005). The research of Teisl and colleagues (2007) demonstrates that the dolphin-tuna controversy, and the subsequent implementation of dolphin-safe labeling affected consumer behavior. Further, the research also provides market-based evidence that consumers respond to eco-labels and that changes in consumer behavior due to the presence of eco-labeling may alter manufacturer behavior as well. Sustainable consumer behavior may be defined as purchasing and non-purchasing decisions made by consumers based on environmental and social criteria. This involves buying products such as organic, regional, and seasonal food products, fair trade food products, dolphin-safe tuna, and Marine Stewardship Council (MSC)-labeled products. It also includes the way consumers use, maintain, replace, and dispose of products (cf. Belz & Pobisch, 2005). Thus, the value of an eco-label should not be viewed exclusively within the context of its impact on a specific production process or purchasing pattern, but in a more holistic way, as a catalyst for change in corporate and consumer cultures. If consumers or companies are prompted by an eco-label to consider the environmental impact of one range of activities, they can reasonably be expected to consider the possible impact of other activities as well. If an eco-label has the potential to influence an individual's purchasing decisions, perhaps it can also influence other decisions such as investments, donations to charity, or voting (cf. UNEP, 2005).

The introduction of eco-labeling appears to be central in that it has consequences far beyond the operation of single, certified businesses in the market arena. It has stimulated the introduction of new ideas, dialogues, and reflections on how to make any practice more sustaina-

ble. Ideas about organic agriculture have stimulated a great deal of green thinking in the conventional part of the industry and among public authorities, where organic agriculture is generally appreciated. As a consequence, results should not be evaluated only by measuring market share, conversion rates, and certified hectares (cf. Boström & Klintman, 2008). Eco-labels visualize and communicate the best choices to consumers, and to many other audiences, including competing producers and a broad network of policymakers. According to Jordan and colleagues, once a critical mass of businesses have applied successfully for an eco-label within a certain market segment, the remaining companies find themselves under considerable market pressure to seek the label for their products (cf. Boström & Klintman, 2008).

The many new initiatives, which have been undertaken partly due to the first labeling initiative, should be assessed and followed. Would we have seen the SFI (the American Forest and Paper Association's Sustainable Forestry Initiative) in the U.S. without the FSC? It has often been said that the FSC is marginalized in the U.S., though such a statement can be made only if one ignores important dynamics in the labeling strategy. In fact, the FSC was perceived as a threat by key industries in the U.S., which was a fundamental reason that the SFI was established. The competition between FSC and SFI has led to the adoption of standards within both systems that are stricter than those that could have been achieved by government mandate. Consequently, even the lower of these two standards goes well beyond legal compliance (cf. Boström & Klintman, 2008).

In short, according to the earlier mentioned impact of various eco-labels, the PWFL can create awareness of the water issue among consumers and inform them about how much water is used in manufacturing a product they consume in daily life. This may alter their consumption behavior to sustainable consumption.

2.4.3.2 Basic Human Needs and Food Security

In general, governments, NGOs, and businesses acknowledge both environmental and economic benefits of product water footprint labeling. However, there are also social benefits generated by the program. Safety for water resources could mean safety not only for resource biotic and abiotic sufficiency or efficiency, but also for human health and welfare through food security (cf. Nordic Council of Ministers, 2008; Shinn & Rosander, 2007; UNDP 2008) and a reduction in conflicts over water resources between and within countries especially in the Near East. The total water footprint in a catchment is socially unsustainable, and thus creates a social hot spot, when all people in the catchment do not enjoy the fulfillment of basic human needs or basic rules of fairness. Water-related basic human needs include a minimum amount of safe and clean freshwater supply for drinking, washing and cooking, and a minimum allocation of water to food production to secure a sufficient level of food supply to all (cf. Hoekstra et al., 2011). While the "right to water for food" has not been formally established, the right to food has been established in the Universal Declaration of Human Rights. Employment is also a basic human need, which may be at risk when downstream fishermen

are affected by pollution from upstream. It is unfair, and therefore not sustainable, for some upstream areas to have blue or grey water footprints that lead to problems for people downstream, for which they are not properly compensated. Expert judgment will determine whether water-related basic human needs or rules of fairness in a certain catchment are violated. However, social conflicts over water will likely often arise when environmental conflicts occur. Therefore, the identification of environmental hot spots will also generate a list of potential social hot spots (Hoekstra et al., 2011). Businesses in the food and beverage sector could play a vital role in creating more sustainable water use along the supply chain through reducing the blue or grey water footprints of their products in order to get the PWFL.

2.4.4 Summary

The potential contribution of current eco-labels and the PWFL to sustainability is unknown. In some circumstances, the most sustainable option is no purchase at all, and in this case there is nowhere to place a label (cf. Peattie, 2009). The PWFL should not be seen as a solution to the problem of unsustainable water consumption, but rather as one tool in a toolbox of sustainable water use options. The fact that product water footprint labeling has certain limits is not a valid reason for rejecting it. It is wise to see and use this labeling scheme not only as an instrument that must supplement a wide range of other mandatory and voluntary tools, which together can build an enduring solution or support societal shift, but also as one form of democratic participation from all stakeholders (cf. Boström & Klintman, 2008; The Environmental Audit Committee, 2009; Wales et al., 2010). With respect to a brief conversation with Professor Hoekstra, reducing water use in order to get a PWFL can cause sustainable effects such as cost reduction in the long-term and efficient water use in production and food security due to preserved water resources from production. However, any water efficiency label that is developed in the future should not be expected to have an impact on its own. Consumer education, marketing, and other incentives such as cash rebates, legislation, and stakeholder engagement, are all necessary in order to achieve a sustainable rate of water consumption. With climate change, urbanization, population growth, and water hungry lifestyles all on the rise, the PWFL would be a step in the right direction toward a future in which the water supply is secure and valued (cf. The Environmental Audit Committee, 2009).

3. EMPIRICAL EVIDENCE FROM THAILAND

3.1 Background of Labeled Food Products in Thailand

Due to the limited number of studies on eco-labeled food products available in Thailand, the organic market in Thailand is presented briefly in order to illustrate the current situation of the market. In 1996, the Thai Farmers Research Centre of the Thai Farmers Bank conducted a study on the organic market. The survey interviewed 780 consumers in Bangkok about their interest in health food. 62% of those interviewed said that they had, at some point, eaten health food. 71% believed that eating health food would make them healthy; 18% were afraid of pollution in food; and 9% believed that health food contributed to a better environment. The main obstacles to buying health food identified by respondents were lack of confidence in organic quality (61%), difficulty of buying (31%), and the higher price (8%). 69% purchased from supermarkets, 21% from green shops, and 6% from wholesalers. For those who did not buy health products, 59% said they were difficult to find, 18% said they were not necessary, and 14% said they were too expensive. In the domestic market, no imported organic product is sold at the moment and only organic fresh vegetables and cereals, mainly rice and beans, are available. (cf. United Nations ESCAP, 2002). In a survey conducted by Chulalongkorn University, 300 bachelor students in Bangkok were asked about their perception and behavior regarding eco-friendly products. It showed that some of them considered the environmental attributes of a product before they decided to buy it. Others, who did not consider the environmental features of a product, reported that there were limited distribution channels to buy eco-friendly products, it was hard to find them, and they were too expensive. Clearly this sample group was concerned about environmental problems; however, their consumption of eco-friendly products was still low (จุฬาลงกรณ์มหาวิทยาลัย, 2009). With respect to a consumer survey about responsible consumption in the Asia-Pacific, 60% of 3,500 respondents from 13 countries tended to buy fair trade and eco-friendly products. A certain percentage of consumers in five countries were willing to pay a price premium for these products, with Thai respondents ranked in the second place – China 94%, Thailand 87%, India 83%, Philippines 82%, and Hong Kong 77%. [4]

Several conclusions can be drawn from these findings. First, there is a slight to moderate demand for eco-friendly goods, which should be certified by a third party. Second, price should remain at the same level as conventional products in order to sell domestically, and third, supermarkets should be the main distributor of eco-labeled products.

According to Panyakul (2002), there are five major producer groups for organic jasmine rice sold to three main traders: the Capital Rice Co. Ltd., the Siam Basmatic Co. Ltd., and Green Net Cooperative. Most of the organic rice is exported, mainly to European markets, with only a small quantity sold domestically. As of June 2003, the government assisted in the organic certification of a total of 3,086 ha of farmlands operated by private exporting companies. These farms cultivated mainly organic fruits and vegetables that were exported to Japan and

the EU. Overall, Thailand already has more than 10,000 ha of organic and in-conversion lands, certified by local or foreign certification bodies (cf. Carambas, 2005). In 2008, organic farming in Thailand increased to 22,000 ha, which is equivalent to 0.1% of Thailand's cultivated area. [5] To sum up, Thailand produces organic products for export and not for domestic supply. The reason might be because demand for organic commodities in foreign countries is higher than domestic demand and prices for exported products are greater than local prices.

Nonetheless, domestic markets represent untapped potential for the expansion of organic agriculture. Health concerns drive the increase in domestic demand for organic food. However, the price premium attached to organic certification makes these products affordable only for urban, educated and more affluent consumers (cf. Santacoloma, 2007), which fits perfectly with the target group for PWFL products as well. The target group's characteristics consist of a financial status of middle to upper class, and an educational background of at least a bachelor's degree. Thus, the majority of the Thai population cannot afford organic, eco-products, or PWFL products due to financial constraints and lack of education. A survey regarding the carbon label conducted in the UK ascertained that these people are driven by poverty and are too poor to care about climate change or saving people in Africa. They are focused on their own survival (cf. The Environmental Audit Committee, 2009).

Despite the fact that Thailand was one of the first countries in Southeast Asia to intro-duce the green label, a decade after implementation, its success in terms of popularity among consumers is unsatisfactory compared to developed countries. Dr. Lohsom-boon's (2010) observes that the main reason for this is that Thais' first priority is price and quality regarding basic functions of the products they buy. They do not care much about eco-friendly attributes embedded in eco-labeled products. Organic products pro-vide direct benefits to consumers' health, whereas eco-labeled products contribute direct advantages to the environment. As a result, eco-products are basically not attractive except when they are priced lower than conventional products. Then, it is likely that consumers will choose them due to their lower price rather environmental concerns. Consumers in developing countries tend to be very price sensitive. Furthermore, Dr. Lohsomboon adds that the eco-label's problem is that it is difficult to communicate objectives of the label for better understanding. Informing people of how good the products are for the environment and how they reduce greenhouse gases does not directly impact consumers or generate an instant effect. They may feel good when they read information on product packages, but they will not buy. There are also misunderstandings that the label increases the price of the product. It is partly true; however, according to evidence provided by CPF, carbon-labeled products are offered for the very same prices as conventional products. In this case, it depends strongly on consumers to choose which one they will purchase based on the products' characteristics. In addition, the calling for environmental consciousness of Thai consumers is not as strong as the calling to consumers in developed countries. Most Thai businesses are enthusiastic about being certified by an eco-label due to export requirements, where consumers are more aware of environmental issues (cf. PTT plc., 2010).

In 2009, one cubic meter of irrigated water in Thailand cost 9.25 Baht, and in the years 2010 and 2011, it cost 9.75 and 10.25 Baht/m^3 respectively. [6][7] This shows that the price of water tends to increase every year and there is a risk that irrigated water will become more expensive in the future. National income per capita in Thailand in 2009 was equivalent to 97,351 Baht, which is equal to 8,113 Baht per month and 267 Baht per day (สำนักบัญชีประชาชาติ สศช., 2009). In recent years, there has been a tremendous rise in bottled water subsidiaries of multinational companies, among them Coca-Cola Bottling Co., Danone, Nestlé, and PepsiCo. Thailand is among the world's top ten markets for bottled water (cf. JS-APMDD, 2003). Thais drink bottled water more frequently than tap water and 1.5 liters of water in a bottle cost approximately 15 Baht, [8] 1.25 liters of a soft drink costs 26 Baht, and 630 ml of beer costs 40 Baht. [9] Basically, one consumes two bottles of water per day, which costs 30 Baht, and is equivalent to 11% of income per day. This excludes costs of food and transportation per day. It can be concluded that water products are an expensive good for most of the Thai population.

3.2 Design of the Survey Questionnaire

In early 2011, 135 Thai respondents participated in this study's survey questionnaire on product water footprint labeling. 85 respondents participated via the internet-based survey and 50 via the paper-based survey. Convenient samples were adopted in the survey because they could provide useful information, especially in a pilot study. These samples differ from an ideal sample that would have been randomly selected (cf. Lomax, 2007). People who do not have access to the Internet might be left out of the internet-based samples. However, the paper-based survey questionnaire was conducted in order to overcome this constraint. The paper-based survey was also included in convenient sampling because 50 respondents were asked to fill out the questionnaire as they walked by selected public places in Bangkok. People who live in other towns might be excluded from this survey. Both methods of the survey were designed to collect the opinions of Thai consumers of PWFL products. Findings of the survey might not represent the Thai population (approximately 67 million in 2011) [10]; however, they might represent the opinion of potential consumers in the metropolitan area of a developing country like Thailand.

88% of these respondents were between 25 and 54 years old. 60% were female and 40% of them were male. Most of them live with their parent or are married and have children. According to the Thai culture, Thais basically live with their parents until marriage, and in some cases, they continue to live with their parent after marriage. In terms of education, most respondents had bachelors and masters degrees. They worked in civil service or state-owned companies, in private companies, in their own companies. Most of the respondents lived in Bangkok. 27% of them earned from 10,001-30,000 Baht per month, and 27% of them earned

from 30,001-50,000 Baht per month, which is equivalent to 333-1,000 U.S. dollars per month and 1,000-1,667 U.S. dollars per month[30] respectively.

The chi-square test of association was adopted and conducted to determine whether there was an association between two categorical variables. These variables include the logo of the PWFL, the format of the PWFL, general interest in eco-labels, and buying of eco-products. The null hypothesis is that there is no association between the earlier mentioned variables and characteristics of respondents such as age, gender, or occupation, whereas the alternative hypothesis is that there is some association between these variables. If the test statistic is larger than the critical value, then the null hypothesis can be rejected in favor of the alternative hypothesis. This would indicate that the observed and expected proportions were not equal across cells such that the two categorical variables have some associations. The larger the differences between the observed and expected proportions, the larger the value of the test statistic and the more likely it is to reject the null hypothesis (cf. Lomax, 2007).

3.3 Main Results of the Survey Questionnaire

The following paragraphs cover the results gathered through internet- and paper-based survey questionnaires as well as interpretation of the results and evidence collected by in-depth expert-interviews.

3.3.1 Logo and Format of the PWFL

Figure 3.1 shows six preliminary designs of the PWFL applied in the survey questionnaire. There is an insignificant difference between results of the internet- and paper-based survey questionnaires,[31] although the paper-based survey lacks color and multimedia in presenting all the labels. As shown in Figure 3.2, information about the water footprint of a product can be delivered to both genders, every age range, and almost all types of educational backgrounds through the choice A of six preliminaries of PWFL, which is presented in water drop with the earth logo and displays absolute amount of actual water footprints together with average amount.

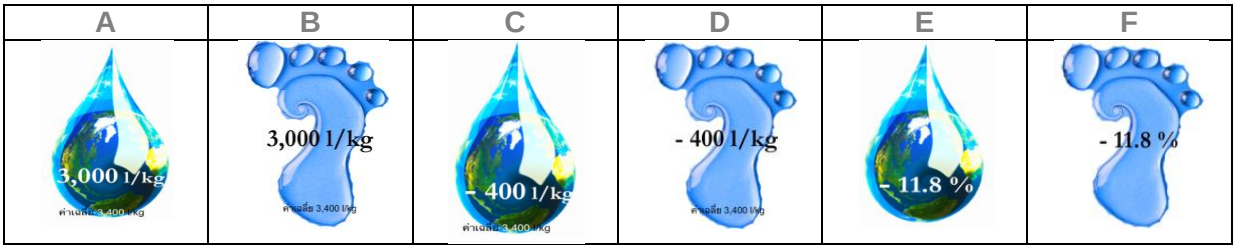


Figure 3.1: Six preliminary designs of PWFL (source: compiled by the author)

[30] 1 U.S. dollar = 30 Baht
[31] For more detail see separate tables in Annex 1.

80% of respondents chose a water drop with the earth as the logo of the PWFL and commented that this design looks nice, polite, attractive, and easy to understand. It made them feel that they were doing something good for the earth and the environment by buying products with this logo. They also commented that the water drop was better than the footprint logo in at least three aspects: communicating information about the water footprint concept, creating awareness about water resources, and being appropriate for consumers regardless of their culture. With respect to Thai culture, a footprint is basically considered negative and impolite to display on food packages, though this logo is more beautiful than the water drop with the earth. On the other hand, 20% of the respondents found that the footprint design was a unique and nice logo, directly referring to the water footprint concept, and that it might be in harmony with the carbon footprint logo in the near future. Those favoring the footprint were also a minority through the internet-based survey questionnaire though it was presented in a blue color.

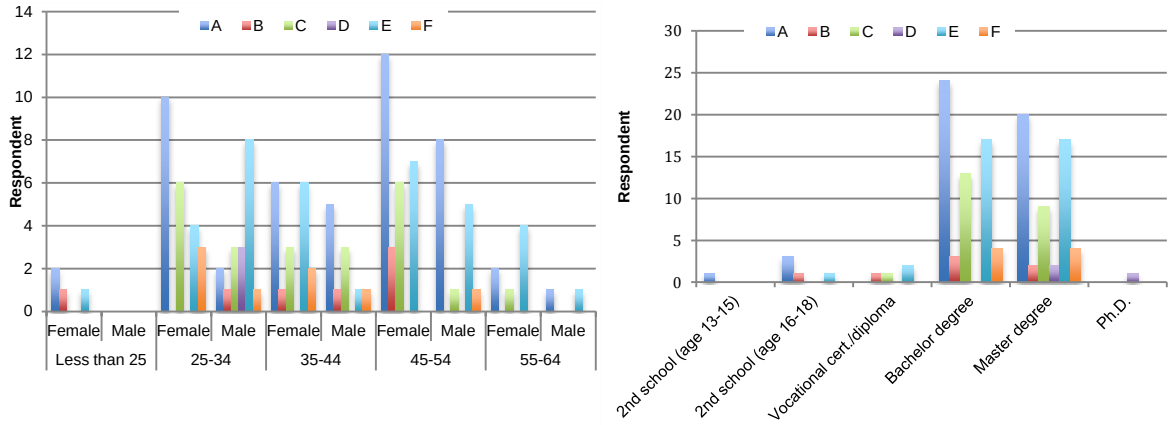


Figure 3.2: Age, gender and educational background in choosing logo and format of PWFL (Q 1.1-1.2[32])

The relationships between the two types of water footprint logos and characteristics of respondents were examined. The null hypothesis is that there is no association between the two types of water footprint logos and gender. The 95 percent quantile point ($\alpha = 0.05$) for the chi-square distribution with two degrees of freedom is 5.991. According to Table 3.1, the critical value is $\chi^2 = 10.154$. Thus the null hypothesis that there is no association between types of water footprint logos and gender can be rejected at the 5-percentage level of significance. A follow-up test could be conducted on those categories where the disparity of the observed and expected frequencies is the greatest. As shown in Table 3.1, the greatest difference was for the water drop logo for both genders.

[32] "Q 1.1-1.2" refers to question number 1.1 and 1.2 in the survey questionnaire. Please consult with the complete survey questionnaire in Annex 1 Section 1.3.

logo*gender Cross-tabulation

			Gender		Total
			Female	*Male*	
Logo	Footprint	Observed frequencies	10	8	18
		Expected frequencies	10.8	7.2	18.0
		% within gender	12.3%	14.8%	13.3%
	None	Observed frequencies	1	8	9
		Expected frequencies	5.4	3.6	9.0
		% within gender	1.2%	14.8%	6.7%
	Water drop	Observed frequencies	70	38	108
		Expected frequencies	64.8	43.2	108.0
		% within gender	86.4%	70.4%	80.0%
Total		Observed frequencies	81	54	135
		Expected frequencies	81.0	54.0	135.0
		% within gender	100.0%	100.0%	100.0%

Chi-Square Tests

	Value	*df*	*Asymp. Sig. (2-sided)*
Pearson Chi-Square	10.154[a]	2	.006

[a] 1 cells (16.7%) have expected count less than 5. The minimum expected count is 3.60.

Table 3.1: Cross-tabulation and χ^2 test of logo and gender[33]

The potential consumers of the PWFL is urban, educated, and more affluent consumers, in case PWFL products were marketed with a price markup. As a consequence, the water footprint logo must be designed in a way that can best communicate with this group. It is possible that the high-income consumers prefer the water drop with the earth logo, whereas the average income consumers choose the footprint logo. Linkages between the water footprint logo and income per month of respondents were investigated. The 95 percent quantile point for the chi-square distribution with six degrees of freedom is 12.592. According to Table 3.2, the critical value is $\chi^2 = 19.628$. As a result, the null hypothesis that there is no relationship between types of logos and income per month can be rejected at the 5-percentage level of significance. Nevertheless, the null hypothesizes between two types of water footprint logos and respondent's age, family status, educational background, and occupation cannot be rejected since their critical χ^2 values are lower than critical values.

It can be concluded that gender and income per month have a significant influence on selecting between the earth in a water drop image and the footprint image to be used as a logo for the PWFL.

[33] Please compare with the original SPSS outputs (German) in Annex 1 section 1.5.

logo*income_per_month Cross-tabulation

			Income_per_month				Total
			Less than 30,001	30,001 - 80,000	More than 80,000	None	
Logo	Footprint	Observed frequencies	4	8	6	0	18
		Expected frequencies	6.1	7.9	3.9	.1	18.0
		% within Income_per_month	8.7%	13.6%	20.7%	.0%	13.3%
	None	Observed frequencies	4	1	3	1	9
		Expected frequencies	3.1	3.9	1.9	.1	9.0
		% within Income_per_month	8.7%	1.7%	10.3%	100.0%	6.7%
	Water drop	Observed frequencies	38	50	20	0	108
		Expected frequencies	36.8	47.2	23.2	.8	108.0
		% within Income_per_month	82.6%	84.7%	69.0%	.0%	80.0%
Total		Observed frequencies	46	59	29	1	135
		Expected frequencies	46.0	59.0	29.0	1.0	135.0
		% within Income_per_month	100.0%	100.0%	100.0%	100.0%	100.0%

Chi-Square Tests

	Value	Df	Asymp. Sig. (2-sided)
Pearson Chi-Square	19.628[a]	6	.003

[a] 7 cells (58.3%) have expected count less than 5. The minimum expected count is .07.

Table 3.2: Cross-tabulation and χ^2 test of logo and income per month

Approximately 40% of respondents selected the first format, which presents the absolute water footprint (3,000 liter per kilogram) of a product displayed together with the absolute amount of average global water footprint (3,400 liter per kilogram) of the same product. This makes it easy for consumers to see the difference, since they can compare the actual water footprint to the average water footprint of a product. Actual water footprints tell consumers how much water is needed in order to produce one unit of a product. Average water footprint gives a clearer picture than percentage reduction of water footprints because the reduction amounts could lead to misunderstanding of the actual meaning. They believe that a huge gap between the actual and the average water footprints shows that producers care for water resources more than other competitors. Respondent comments indicate that this format gives consumers a chance to make purchase decisions depending on the amount of water used in production processes, so that they can support producers in using less water.

The percentage reduction of water used can be added on the logo as well, but without a minus sign because most respondents feel that the minus sign has a negative meaning. This might need some consideration because a label displaying e.g. “-34%” says that the product consumes 34% less water than average. If the label displays only “34%” in order to avoid the minus sign, it could lead to misinterpretation as if this product consumes only 34% water of the average product. In order to maintain the original meaning and avoid the minus sign, the PWFL would need to display either “66%” or “reduced 34%.” 33% of respondents voted for percentage water reduction and commented that percentage shows how much water is

saved and allows consumers to compare water footprints of one product with other products, regardless of their characteristics in terms of kind and content.

format*gender Cross-tabulation

			Gender		Total
			Female	Male	
Format	Absolute	Observed frequencies	37	18	55
		Expected frequencies	33.0	22.0	55.0
		% within gender	45.7%	33.3%	40.7%
	None	Observed frequencies	1	8	9
		Expected frequencies	5.4	3.6	9.0
		% within gender	1.2%	14.8%	6.7%
	Percent	Observed frequencies	27	18	45
		Expected frequencies	27.0	18.0	45.0
		% within gender	33.3%	33.3%	33.3%
	Reduction	Observed frequencies	16	10	26
		Expected frequencies	15.6	10.4	26.0
		% within gender	19.8%	18.5%	19.3%
Total		Observed frequencies	81	54	135
		Expected frequencies	81.0	54.0	135.0
		% within gender	100.0%	100.0%	100.0%

Chi-Square Tests

	Value	*df*	*Asymp. Sig. (2-sided)*
Pearson Chi-Square	10.201[a]	3	.017

[a] 1 cells (12.5%) have expected count less than 5. The minimum expected count is 3.60.

Table 3.3: Cross-tabulation and χ^2 test of format and gender

It is possible that the personal characteristics of respondents might influence decisions about which formats are most suitable, easiest to understand, and should be applied as the PWFL. As a result, associations between three formats of the PWFL and characteristics of respondents were investigated through SPSS. The 95 percent quantile point for the chi-square distribution with three degrees of freedom is 7.815. With regard to Table 3.3, the critical value is $\chi^2 = 10.201$. Hence the null hypothesis can be rejected at the 5-percentage level of significance.

The 95 percent quantile point for the chi-square distribution with nine degrees of freedom is 16.919. According to Table 3.4, the critical value is $\chi^2 = 19.311$. As a result, the null hypothesis that there is no association between formats of the PWFL and income per month can be rejected at the 5-percentage level of significance. Nonetheless, the null hypothesizes between three formats of the PWFL and respondent's age, family status, educational background, and occupation cannot be rejected since their χ^2 values are lower than critical values.

format*income_per_month Cross-tabulation

			Income_per_month				Total
			Less than 30,001	30,001 - 80,000	More than 80,000	None	
Format	Absolute	Observed frequencies	18	26	11	0	55
		Expected frequencies	18.7	24.0	11.8	.4	55.0
		% within Income_per_month	39.1%	44.1%	37.9%	.0%	40.7%
	None	Observed frequencies	4	1	3	1	9
		Expected frequencies	3.1	3.9	1.9	.1	9.0
		% within Income_per_month	8.7%	1.7%	10.3%	100.0%	6.7%
	Percent	Observed frequencies	13	23	9	0	45
		Expected frequencies	15.3	19.7	9.7	.3	45.0
		% within Income_per_month	28.3%	39.0%	31.0%	.0%	33.3%
	Reduction	Observed frequencies	11	9	6	0	26
		Expected frequencies	8.9	11.4	5.6	.2	26.0
		% within Income_per_month	23.9%	15.3%	20.7%	.0%	19.3%
Total		Observed frequencies	46	59	29	1	135
		Expected frequencies	46.0	59.0	29.0	1.0	135.0
		% within Income_per_month	100.0%	100.0%	100.0%	100.0%	100.0%

Chi-Square Tests

	Value	Df	Asymp. Sig. (2-sided)
Pearson Chi-Square	19.311[a]	9	.023

[a] 7 cells (43.8%) have expected count less than 5. The minimum expected count is .07.

Table 3.4: Cross-tabulation and χ^2 test of format and income per month

It can be concluded that gender and income per month have a significant influence on selection among three kinds of PWFL formats. This is identical with the results of choosing between two PWFL logos mentioned previously. It is interesting that the educational background of respondents does not play any role in deciding whether logos and formats are suited to use as a PWFL. The reason might be that there is no remarkable variation between respondents' educational backgrounds. As can be seen, 48% of respondents identified that their highest education level was a bachelor degree, and 43% of respondents stated that their highest educational level was a master degree. Results of the chi-square test of association between logos and formats of the label and educational backgrounds of respondents would possibly change, if there was more variety among respondents' education status.

In conclusion, based on the opinions of 135 respondents, information about the water footprint of a product can be best delivered through choice A, the water drop with the earth that displays the absolute amount of actual water footprint, together with the average amount. Results of the survey show that 80% of the respondents chose a water drop with the earth as the logo of the PWFL, and approximately 40% of the respondents selected the first format,

which presents the absolute water footprint (3,000 liter per kilogram) of a product displayed together with the absolute amount of average global water footprint (3,400 liter per kilogram) of the same product. With respect to SPSS results, it can be concluded that gender and income per month have a significant influence on selection between the earth in a water drop and the footprint as a logo of the PWFL as well as on selection among three kinds of PWFL formats.

In two in-depth expert-interviews, both interviewees chose choice A as the most suit-able for the PWFL. The first interviewee, Mrs. Kimsri, prefers the label, which shows the average amount of water needed as well as the absolute water used, because if consumers want to calculate their own water footprints, then they can directly use the amount on PWFL. Besides, in Thai culture, the earth in a water drop is more appropriate than the footprint, and it also shows that both the earth and water are concerned in production processes. Dr. Lohsomboon actually favors neither form because in her opinion they cannot communicate the meaning of a water footprint to end consumers in Thailand. Moreover, a footprint icon is absolutely not suitable for the Thai culture. No footprint icon is applied to the carbon label used in Thailand. If a water drop with the earth will be employed, it might require advertisements in order to relate it with the water footprint concept. Nonetheless, she found that the water drop is better than the footprint and selects choice A because it is easier, at least for her, to understand.

3.3.2 Willingness to Pay for PWFL Products

In order to gain information about the willingness to pay (WTP) for PWFL products, four products were chosen and used in surveys. These were eggs, milk, rice, and chicken meat. Rice consumption in Thailand exceeds 100 kg per capita per year, which is much higher than the U.S. average, which is about 10 kg (cf. Hoekstra & Chapagain, 2010). People in Thailand consume rice almost three times per day. In addition, 14.7 kg of chicken meat are consumed per person per year, [11] because it is cheaper than other kinds of meat. Eggs are a favorite and are very easy to cook. They are used as a basic ingredient not only for main courses, but also for various kinds of Thai desserts. Thai consume 165 eggs per person per year according to the report of the National Food Institute of Thailand. [11] As a result, almost every Thai household has at least one egg in its refrigerator. Milk is not a favorite drink for Thais nor is an essential ingredient in Thai kitchens. Coconut milk is more likely to be used in cooking than animal milk due to its widely associated better taste and aroma. However, the government of Thailand promotes milk as something that children should drink every day. This part of the research is designed to find out whether the WTP for PWFL eggs, milk, rice, and chicken meat differs due to different backgrounds and demand for them in respondents' daily lives.

Evidence from the survey illustrated that there is no significant sensibility among the four products with respect to Figure 3.3, which means WTP remains almost the same regardless of the kinds of product. However, the markup price of rice could be as high as 30%, followed

by eggs at 20%, and chicken meat at 10%. As the graph illustrates, rice is the highest ranked markup price at 30%, eggs are highest classes at 20% markup price, and chicken meat is the highest position at the 10% markup price.

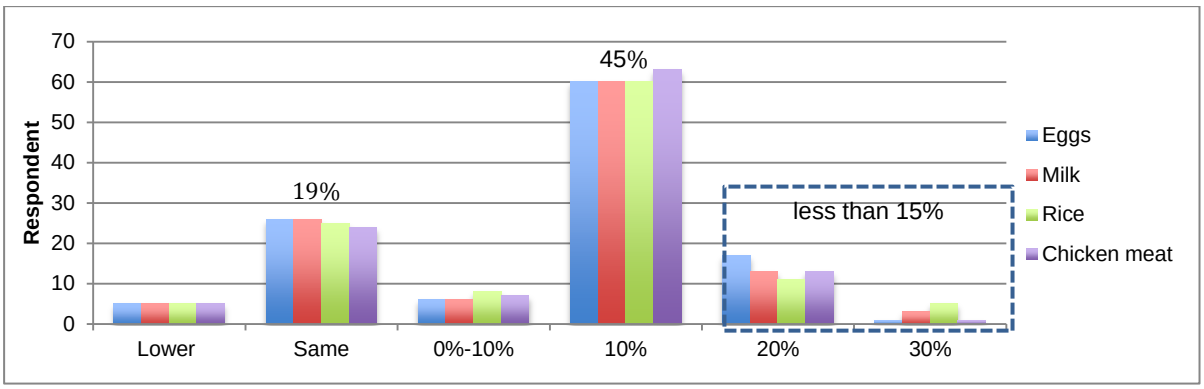


Figure 3.3: Willingness to pay for PWFL products (Q 1.3-1.6)

This implies that Thai consumers set a high value on rice, which is widely used in their kitchens, and they would like to support farmers and producers who cultivate rice with low water consumption and pollution. It could be a useful indication for businesses producing rice, eggs, and chicken meat that it can begin with rice if it wants to promote the PWFL because rice warrants the highest percentage markup compared with the other products. Although the actual differences are not that high, as already mentioned, there is insignificant sensibility among the four products. In addition to being exported to developed countries, the PWFL rice can be sold domestically. There is the potential that a business can benefit from both markets as already explained in Section 2. After that it can begin with the water footprints of chicken meat, which in fact can also generate water footprints of an egg because both are sharing the same database used in preparing water footprint accounting.

Due to insignificant differences among the four commodities, the following results analysis and interpretation will use data from WTP eggs as a representative of PWFL products in order to avoid data redundancy. According to Figure 3.3, less than 15% of respondents are willing to pay for PWFL products with a 20-30% markup from the normal price. 45% of respondents prefer to pay only a 10% markup price. Most respondents who can afford this markup price are between 25 and 34 years old and live with their parents. It is possible that some of them do not buy basic food. Rather, their parents make those purchases, so their WTP would be only hypothetical. Their average income per month is between 30,001 and 50,000 Baht, which is equivalent to 1,000-1,667 U.S. dollars per month. Nonetheless, 19% of respondents insisted that they would buy only if the price stayed the same as conventional products. 46% of this group is between 25 and 34 years old, and 62% of this group earns between 10,001 and 50,000 Baht per month, which is equal to 333-1,667 U.S. dollars per month (see Figure 3.4). This indicates indirectly that young respondents do not want to pay more for water-friendly commodities regardless of their income per month. If a company launches a PWFL product, its price should be the same as the conventional one or could be marked up to 10%. Figure 3.4 ascertains that a 10% markup price covers all kinds of re-

spondents' family status as well as seven different types of respondents' occupation and is affordable by every range of respondents' income per month.

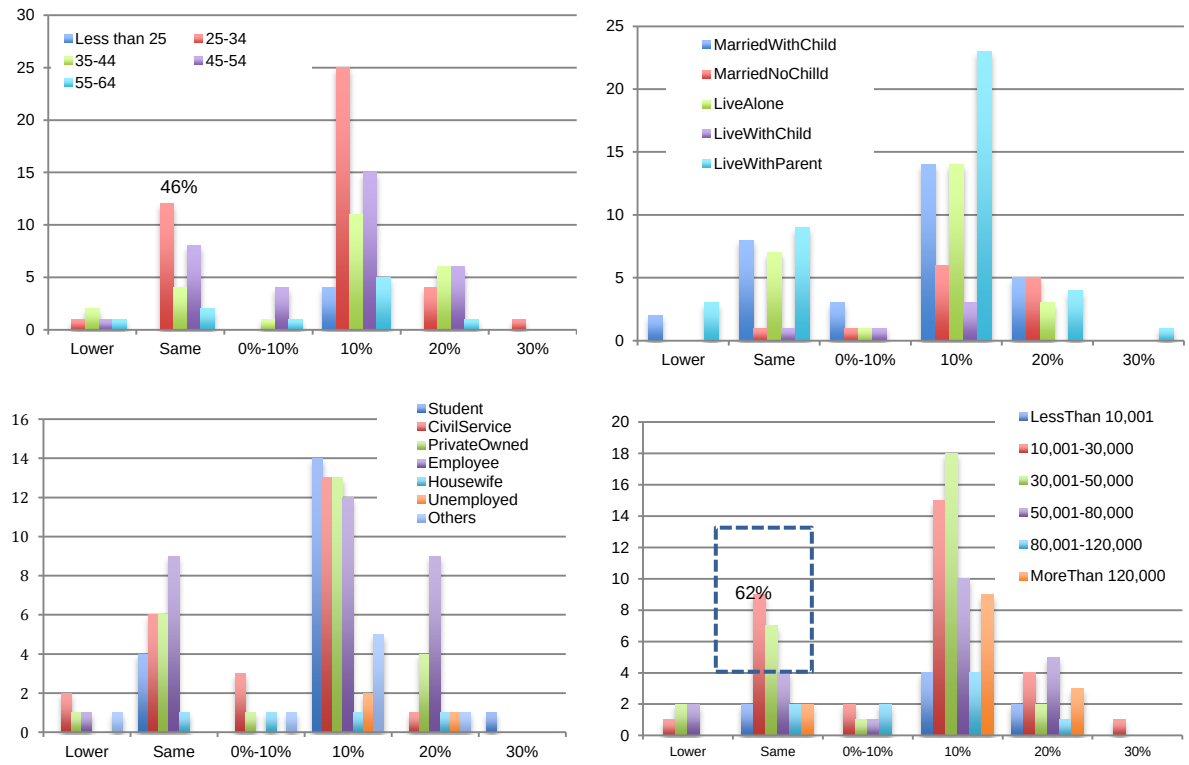


Figure 3.4: Age, family status, occupation, and income per month and willingness to pay for PWFL eggs[34] (Q 1.3)

Since there are insignificant differences among the four products, to find out whether there are any relationships between WTP and characteristics of respondents, observed data on WTP for PWFL eggs must be used. Characteristics of respondents include age, gender, family status, educational background, occupation, and income per month. The WTP variable is scaled into two groups: "Less than 10%" and "10% or more." The income per month variable is also categorized into two classes: "Less than 30,001 Baht per month" and "More than 30,000 Baht per month." This classification method is used because the survey results indicated that two weighted groups of respondents preferred to pay less than 10%, whereas another group was willing to pay a markup price of 10%. Based on targeted customers and cost of living in Thailand, particularly in Bangkok, the potential consumers of PWFL products are expected to earn at least 30,001 Baht per month in order to theoretically afford PWFL products.

The 95 percent quantile point for the chi-square distribution with four degrees of freedom is 9.488. As shown in Table 3.5, the critical value is $\chi^2 = 6.300$. As a result, the null hypothesis cannot be rejected.

[34] Y-axis refers to amount of respondent.

Unexpectedly, other tests of the relationship between WTP and respondent's characteristic generated the same result. Thus, it could be concluded that there is no relationship between these variables based on 135 persons sample group with 5-percentage level of significance. In addition, tests of the relationship between WTP and income per month for the other three products were conducted as well and outputs included $_{milk}\chi^2 = 5.457$, $_{rice}\chi^2 = 5.736$, $_{chicken\ meat}\chi^2 = 5.472$. Again these results present the same direction as the result of PWFL eggs. Regardless of a commodity's category, no association between WTP and respondent's characteristics could be found based on the 135 persons sample group with a 5-percentage level of significance.

WTP_Eggs*income_per_month_WTP Cross-tabulation

			Income_per_month_WTP			*Total*
			Less than 30,001	*More than 30,000*	*None*	
WTP_Eggs	10% or more	Observed frequencies	26	52	0	78
		Expected frequencies	26.6	50.8	.6	78.0
		% within Income_per_month_WTP	56.5%	59.1%	.0%	57.8%
	less than 10%	Observed frequencies	14	24	0	38
		Expected frequencies	12.9	24.8	.3	38.0
		% within Income_per_month_WTP	30.4%	27.3%	.0%	28.1%
	None	Observed frequencies	6	12	1	19
		Expected frequencies	6.5	12.4	.1	19.0
		% within Income_per_month_WTP	13.0%	13.6%	100.0%	14.1%
Total		Observed frequencies	46	88	1	135
		Expected frequencies	46.0	88.0	1.0	135.0
		% within Income_per_month_WTP	100.0%	100.0%	100.0%	100.0%

Chi-Square Tests

	Value	*df*	*Asymp. Sig. (2-sided)*
Pearson Chi-Square	6.300[a]	4	.178

[a] 3 cells (33.3%) have expected count less than 5. The minimum expected count is .14.

Table 3.5: Cross-tabulation and χ^2 test of WTP for PWFL eggs and income per month

Another effort is to find out whether there is a linkage between WTP and frequency of buying eco-labeled products. The assumption is that consumers who often buy eco-products are likely to be willing to pay for PWFL products as well since there is a similar value added attribute embedded in a product. The null hypothesis is that there is no association between WTP and frequency of buying eco-labeled products. The 95 percent quantile point ($\alpha = 0.05$) for the chi-square distribution with nine degrees of freedom is 16.919. Regarding Table 3.6, the critical value is $\chi^2 = 11.444$, so the null hypothesis cannot be rejected at the 5-percentage level of significance. There is no relationship between these two variables based on 135 respondents as the sample group with 5-percentage level of significance. This could imply that the WTP for PWFL products is independent from frequency of buying eco-labeled products. As Table 3.6 shows, 25 respondents who often purchase eco-products are most willing to

pay a 10% markup price for PWFL products, and 18 respondents who hardly bought eco-products said that a 10% markup price of PWFL products was affordable.

WTP_Eggs*buying_ecoproducts Cross-tabulation

			Buying_Ecoproducts				*Total*
			Hardly	*None*	*Often*	*Sometimes*	
WTP_Eggs	10%	Observed frequencies	18	1	25	16	60
		Expected frequencies	15.6	1.8	19.6	23.1	60.0
		% within Buying_Ecoproducts	51.4%	25.0%	56.8%	30.8%	44.4%
	less than 10%	Observed frequencies	9	2	10	17	38
		Expected frequencies	9.9	1.1	12.4	14.6	38.0
		% within Buying_Ecoproducts	25.7%	50.0%	22.7%	32.7%	28.1%
	more than 10%	Observed frequencies	3	1	3	11	18
		Expected frequencies	4.7	.5	5.9	6.9	18.0
		% within Buying_Ecoproducts	8.6%	25.0%	6.8%	21.2%	13.3%
	None	Observed frequencies	5	0	6	8	19
		Expected frequencies	4.9	.6	6.2	7.3	19.0
		% within Buying_Ecoproducts	14.3%	.0%	13.6%	15.4%	14.1%
Total		Observed frequencies	35	4	44	52	135
		Expected frequencies	35.0	4.0	44.0	52.0	135.0
		% within Buying_Ecoproducts	100.0%	100.0%	100.0%	100.0%	100.0%

Chi-Square Tests

	Value	*df*	*Asymp. Sig. (2-sided)*
Pearson Chi-Square	11.444[a]	9	.246

[a] 6 cells (37.5%) have expected count less than 5. The minimum expected count is .53.

Table 3.6: Cross-tabulation and χ^2 test of WTP for PWFL eggs and frequency of buying eco-labeled products

Nevertheless, there could be significant associations between each WTP of four products. For example, as shown in Table 3.7, the null hypothesis is that the two variables, WTP for PWFL eggs and WTP for PWFL milk, are independent from each other. The 95 percent quantile point for the chi-square distribution with nine degrees of freedom is 16.919. According to Table 3.7, the critical value is $\chi^2 = 292.527$, and as a result, the null hypothesis that the two variables are independent can be rejected at the 5-percentage level of significance. It could be said that if one is willing to pay 10% markup price for PWFL milk, one will also be willing to pay the same rate with other PWFL products. This could indicate that there is no sensitivity among the four products.

To sum up, further research on WTP for PWFL products is recommended in order to prepare sound pricing strategy for PWFL products.

WTP_Eggs*WTP_Milk Cross-tabulation

			WTP_Milk				Total
			less than 10%	10%	more than 10%	None	
WTP_Eggs	10%	Observed frequencies	0	55	2	3	60
		Expected frequencies	16.4	26.7	7.1	9.8	60.0
		% within WTP_Milk	.0%	91.7%	12.5%	13.6%	44.4%
	less than 10%	Observed frequencies	36	0	0	2	38
		Expected frequencies	10.4	16.9	4.5	6.2	38.0
		% within WTP_Milk	97.3%	.0%	.0%	9.1%	28.1%
	more than 10%	Observed frequencies	0	4	14	0	18
		Expected frequencies	4.9	8.0	2.1	2.9	18.0
		% within WTP_Milk	.0%	6.7%	87.5%	.0%	13.3%
	None	Observed frequencies	1	1	0	17	19
		Expected frequencies	5.2	8.4	2.3	3.1	19.0
		% within WTP_Milk	2.7%	1.7%	.0%	77.3%	14.1%
Total		Observed frequencies	37	60	16	22	135
		Expected frequencies	37.0	60.0	16.0	22.0	135.0
		% within WTP_Milk	100.0%	100.0%	100.0%	100.0%	100.0%

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	292.527[a]	9	.000

[a] 6 cells (37.5%) have expected count less than 5. The minimum expected count is 2.13.

Table 3.7: Cross-tabulation and χ^2 test of WTP for PWFL eggs and WTP for PWFL milk

3.3.3 Water

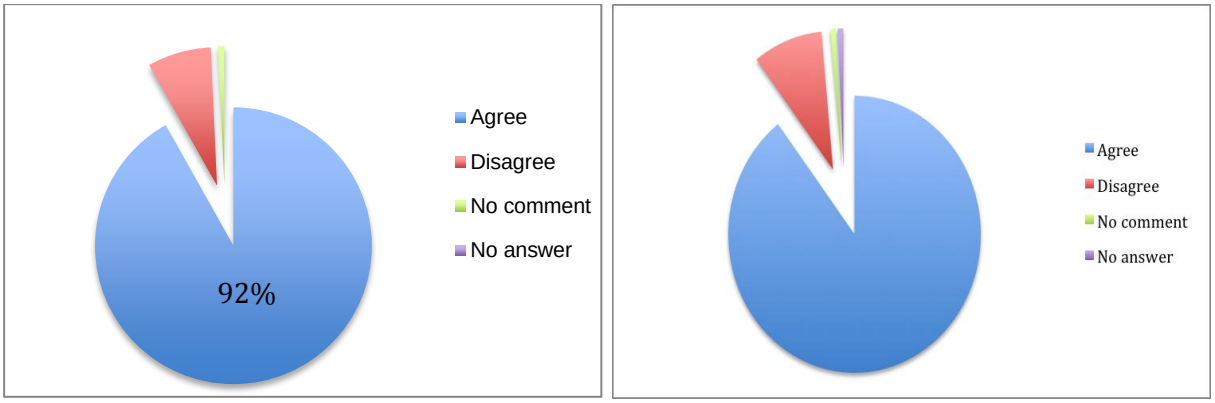


Figure 3.5: *left* Opinion on "water is a finite resource" (Q 2.1-2.2) *right* "No water = No food" (Q 2.4-2.5)

More than 90% of the 135 respondents (see Figure 3.5 *left*) agreed that water, particularly freshwater and clean water, is a finite resource, and they also provided their opinion regarding this subject as follows. Some of them highlighted the fact that water is a basic element of every life and water resources are negatively affected when some environmental factors are disturbed. They thought that awareness of water scarcity was required and should be promoted among Thailand's inhabitants. They also expressed that an incompatibility between population growth and water consumption, insufficient forests, and global warming are causing water shortage, which has a tremendous impact on agricultural exported products. In

some areas, particularly northeast and west Thailand, face severe water scarcity in the dry season due to their geographic constraints. Some mentioned that there is a lot of rain per year, but water management plans and policies are poor. As a result, every household should have its own water management and conservation plans in case that water is suddenly unavailable. Last but not least, one person commented that access to water resources is limited, especially in rural areas. However, less than 1% argued that there is a plenty of water on this planet and claimed that the report of the UN insisted that there is enough water for everyone. Water scarcity is in fact the result of poor water governance, corruption, and lack of human resources and budget to properly manage it. They believed that water is always on this planet. It just changes form and can be reused and recycled, unlike oil.

The next issue is to assess respondents' perceptions of the relationship between water scarcity and food safety. As shown in Figure 3.5 *right*, about 90% of the respondents agreed that food security depends strongly on water resources because water is vital to agriculture and the food industry. They also commented that, in fact, plants, animals, and humans cannot live without water and insufficient water can lead to a lack of food, clothes, shelters, electricity, and fuel. Some of them even said that no water is equal to no life.

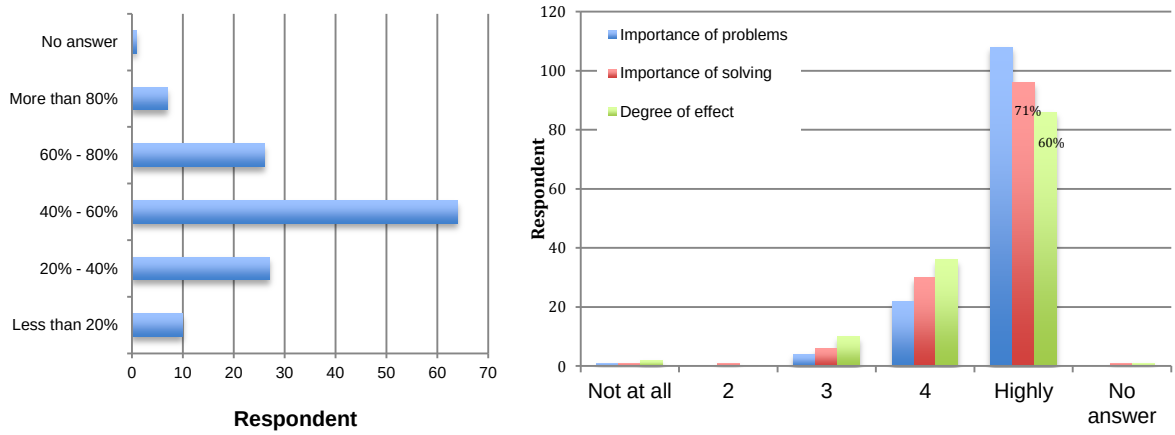


Figure 3.6: *left* Percentage of water use by agricultural sector (Q 2.3) *right* Degree of importance of water problems in Thailand and solving water problems parallel to the effects of water problems on a personal life (Q 2.6, 2.7, 2.9)

As mentioned in Section 2, agriculture consumes 60-80% of global water resources, and as much as 90% in some developing countries. However, regarding Figure 3.6 *left*, most respondents believed that agriculture consumes only 40-60% of global water resources. Figure 3.6 *right* shows that more than 100 respondents are aware that Thailand has water problems, and about 60% of them ranked it as a highly important problem that strongly affects their personal life. 96 respondents, or 71%, expressed that solving water problems is highly critical.

Another examination conducted sought to analyze respondents' opinions on the degree of relevancy of various causes contributing to water problems in Thailand. As illustrated in Figure 3.7, global warming, which provokes droughts, unseasonal rain, and floods, were ranked

by 73 respondents (54%) as very relevant to water problems in Thailand. 63 respondents, or 47%, believed that population growth is very relevant because it en-larges demand for daily water use such as drinking water and sanitation. The trend to-ward water hungry lifestyles, which includes washing cars too frequently, bathing in Jacuzzi tubs or private swimming pools, and inefficient or careless use by the agricultural sector was rated as relevant to water problems in Thailand by approximately 40% of respondents. 90 respondents (67%) scored the industrial sector as very relevant to generating water problems in Thailand due to its lack of wastewater treatment processes. 60% of respondents suggested that lack of efficient water management policies from the government is very relevant to water problems.

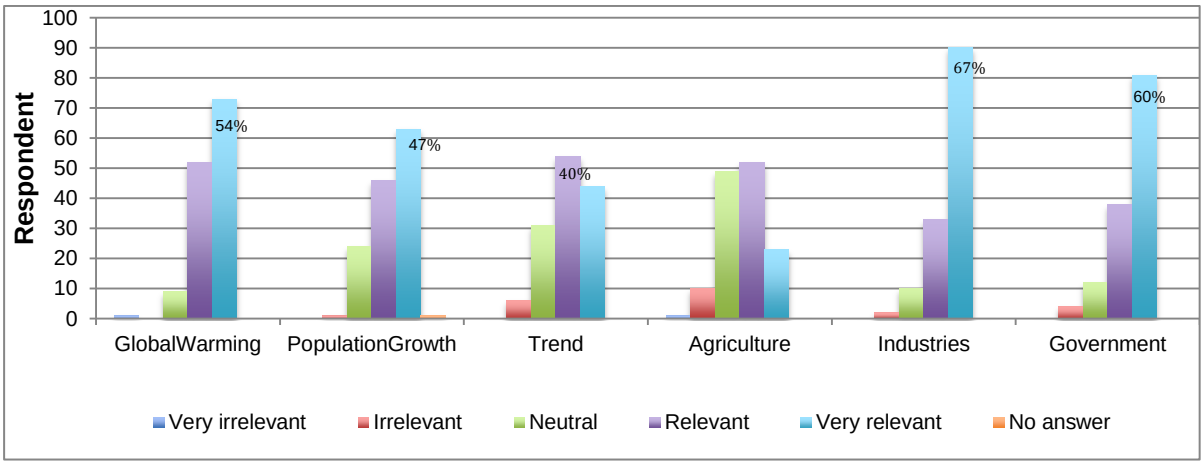


Figure 3.7: Causes of water problems in Thailand (Q 2.8)

In conclusion, respondents perceived and felt that the government and the industrial sector were the main players whose activities and functions contribute to water problems in Thailand, which can be categorized into two groups: water scarcity and water pollution.

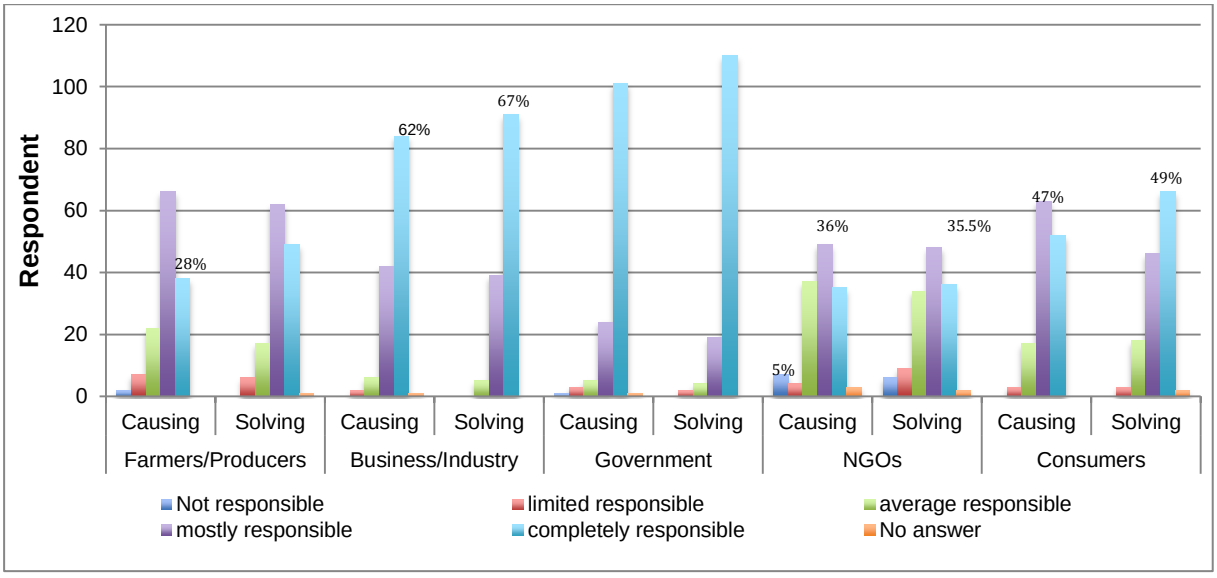


Figure 3.8: Roles of stakeholders in causing and solving water problems in Thailand (Q 2.10-2.11)

Figure 3.8 shows respondents' opinions about the five stakeholders who should be responsible for causing and solving water problems. The government of Thailand is absolutely responsible for creating and unfolding water problems, affirmed more than 100 respondents. About 65% of respondents indicated that business or industry should take completely responsibility for stressing water resources as well as for finding solutions for water problems. Seven respondents (5%) felt that NGOs have no responsibility for water issues, whereas almost 50 respondents (36%) commented that NGOs were mostly responsible for causing and solving water problems. Only 38 respondents (28%) identified farmers and producers as completely responsible for causing water problems, although their activities are directly related to water resources. Respondents' opinions on the role of consumers in creating and solving water problems were interesting. On one hand, 63 respondents (47%) felt that consumers should take, most, though not all responsibility for causing the country's water problems. On the other hand, 66 respondents (49%) expressed that consumers should take full responsibility for solving water problem. This shows that some Thai consumers are likely to participate in solving water problems. Thus, it can be said that there is a hypothetical demand for PWFL products, if product water footprint labeling can ameliorate water scarcity and water pollution. It must be noted; however, that there might be a discrepancy between stated answers in a questionnaire and actions when it comes to buying decisions at the point of sale and markup prices.

3.3.4 Product Water Footprint Label

The survey assessed respondents' awareness and perceptions of eco-labels and eco-products in Thailand, which can be used as basic knowledge for launching PWFL in the future. Figure 3.9 *left* illustrates that almost 100 respondents (73%) have an average to relatively high interest in eco-labeled products and 69% of respondents reported that an eco-label has an aver-age to relatively high influence on their purchasing decisions (see Figure 3.9 *right*). However, some respondents questioned what eco-products actually were because they have never seen this kind of product and were unaware that such products were sold in the Thailand market.

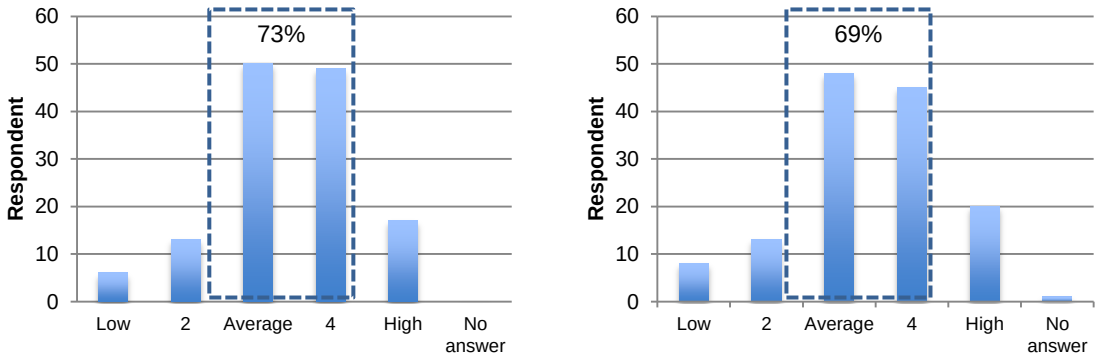


Figure 3.9: *left* Interest in eco-labeled products (Q 3.1) *right* Influence of an eco-label on purchasing decisions (Q 3.2)

The chi-square test of association was adopted and conducted to determine whether there is an association between the interest in eco-labeled products and characteristics of respondents. Owing to SPSS outputs, it could be summarized that there could be no relationships between interest in eco-labeled products and age, gender, family status, and educational background of respondents, on the basis of the 135 respondent sample group with a 5-percentage level of significance. Nonetheless, there could be an association between interest in eco-labeled products and occupation of respondents with regard to Table 3.8. The interest in eco-labeled products was categorized into three groups: disinterest, mixed feeling, and interest, while occupation of respondents was classified into three sets. The first set, "Civil" represents respondents who work in the civil service or for state-owned companies. The "Private" set is composed of employees in privately owned companies, and the last group, "Unemployed" is composed of students, housewives, and unemployed people. Eight respondents of the "Others" group in the survey are divided into the "Civil" (four respondents) and "Private" sets (four respondents), whereas two respondents of the "Others" group are classified as "None" due to a lack of available data. According to Table 3.8, the critical value is $\chi^2 = 12.603$. Thus the null hypothesis can be rejected at the 5-percentage level of significance.

interest_in_ecolabel*occupation Cross-tabulation

			Occupation				*Total*
			Civil	*None*	*Private*	*Unemploy*	
Interest_in_ecolabel	Disinterest	Observed frequencies	10	0	7	2	19
		Expected frequencies	4.9	.3	9.7	4.1	19.0
		% within Occupation	28.6%	.0%	10.1%	6.9%	14.1%
	Interest	Observed frequencies	16	2	36	12	66
		Expected frequencies	17.1	1.0	33.7	14.2	66.0
		% within Occupation	45.7%	100.0%	52.2%	41.4%	48.9%
	Mixed feeling	Observed frequencies	9	0	26	15	50
		Expected frequencies	13.0	.7	25.6	10.7	50.0
		% within Occupation	25.7%	.0%	37.7%	51.7%	37.0%
Total		Observed frequencies	35	2	69	29	135
		Expected frequencies	35.0	2.0	69.0	29.0	135.0
		% within Occupation	100.0 %	100.0%	100.0%	100.0%	100.0%

Chi-Square Tests

	Value	*df*	*Asymp. Sig. (2-sided)*
Pearson Chi-Square	12.603[a]	6	.050

[a] 5 cells (41.7%) have expected count less than 5. The minimum expected count is .28.

Table 3.8: Cross-tabulation and χ^2 test of interest in eco-label and occupation

To summarize, there could be a relationship between occupation of respondents and their interest in eco-labeled products. More than half of the unemployed set had mixed feelings about eco-labeled products, whereas the almost same amount of the civil set are interested in them. Most respondents in the private set are interested in eco-labeled products. Members of the unemployed set might have mixed feelings about eco-labeled products because of their financial constraints, insufficient education, and lack of interest. There was a great dis-

crepancy between the observed and expected frequencies in the first cell between “Civil” and “Disinterested.” It is worthwhile to conduct further re-search on the relationship between consumers working in civil service and their interest in eco-labeled products.

Another relationship could be found between the interest in eco-labeled products and income per month of respondents, as shown in Table 3.9. The critical value is $\chi^2 = 13.258$, as a result, the null hypothesis that there is no association between interest in eco-labels and income per month can be rejected. Regarding the cross-tabulation, approximately 36% of respondents who earn more than 30,000 Baht per month are interested in eco-labeled products. This result supports the financial feature of the PWFL potential-buyer group, which is consumers who earn at least 30,000 Baht per month. This group has an interest in eco-labeled products, which can be comparable to PWFL products. On the contrary, the majority of respondents who earn less than 30,001 per month have mixed feeling about eco-labeled products. This finding supports the previous assumption about the financial constraints of the unemployed group. Further tests should focus on the association between respondents who are paid 30,001-80,000 Baht per month and their mixed feelings about eco-labeled products regarding the great disparity between the observed (13) and expected frequencies (21.9).

interest_in_ecolabel*income_per_month Cross-tabulation

			Income_per_month				*Total*
			Less than 30,001	*30,001 - 80,000*	*More than 80,000*	*None*	
Interest_in_ecolabel	Disinterest	Observed frequencies	5	12	2	0	19
		Expected frequencies	6.5	8.3	4.1	.1	19.0
		% within Income_per_month	10.9%	20.3%	6.9%	.0%	14.1%
	Interest	Observed frequencies	17	34	14	1	66
		Expected frequencies	22.5	28.8	14.2	.5	66.0
		% within Income_per_month	37.0%	57.6%	48.3%	100.0%	48.9%
	Mixed feeling	Observed frequencies	24	13	13	0	50
		Expected frequencies	17.0	21.9	10.7	.4	50.0
		% within Income_per_month	52.2%	22.0%	44.8%	.0%	37.0%
Total		Observed frequencies	46	59	29	1	135
		Expected frequencies	46.0	59.0	29.0	1.0	135.0
		% within Income_per_month	100.0 %	100.0%	100.0%	100.0%	100.0%

Chi-Square Tests

	Value	*df*	*Asymp. Sig. (2-sided)*
Pearson Chi-Square	13.258[a]	6	.039

[a] 4 cells (33.3%) have expected count less than 5. The minimum expected count is .14.

Table 3.9: Cross-tabulation and χ^2 test of interest in eco-label and income per month

As shown in Figure 3.10 *left*, more than 80% of respondents, or 110 of 135 respondents, say they understand that a PWFL on a product indicates that a business has already improved,

adapted, or developed its production process to use less water, and 80% of them (see Figure 3.10 *right*) expressed that a PWFL shows that the business has exercised social responsibility by implementing water-friendly production processes.

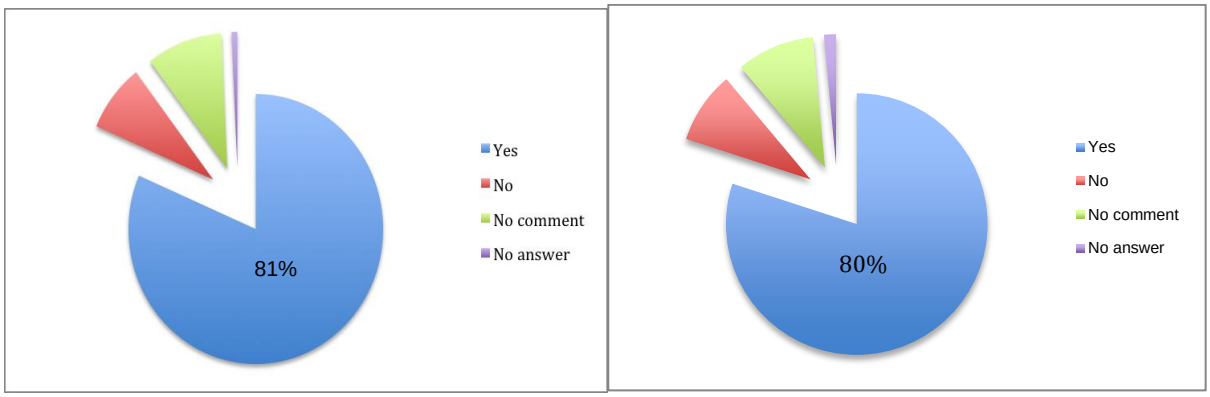


Figure 3.10: *left* A PWFL product and production development (Q 3.3) *right* A PWFL product and the social responsibility (Q 3.4)

Since Thai consumers are mainly conscious of the price and quality of a product, a question regarding the quality of a PWFL product was included in the survey. Only 35 respondents disagreed (14%) or tended to disagree (12%) when they were asked whether they thought that the quality of a PWFL product was better than non-labeled products in the same range (see Figure 3.11 *left*). 34% of respondents neither disagreed nor agreed with the same question. They presumed that the quality of a PWFL product was neither good nor bad in comparison with non-labeled products. The fact is that a PWFL does not certify that the quality of a product is better than conventional products. Rather, it guarantees that a PWFL product was produced through water-friendly production processes. Thus, 38.5% of respondents have the wrong perception of the PWFL. Essentially, an effective public relations and education campaign on the definition of the PWFL is needed.

Since trustworthiness of the label is a crucial factor, two questions about this were embedded in the questionnaire. Figure 3.11 *right* displays an enormous gap in trustworthiness depending on whether labeling is controlled by a third party or by the producer without a third party. 21% of respondent definitely trust the PWFL if it certified and controlled by a third party, whereas 65% of them count on the trustworthiness of PWFL certified by a third party to some extent. Only five respondents (4%) have definite confidence in the PWFL when it is under the control of producers, in contrast to the majority, that hardly trust the PWFL without control and oversight by a third party. This result indicates that the PWFL needs to be certified by a third party in order to gain trustworthiness from consumers.

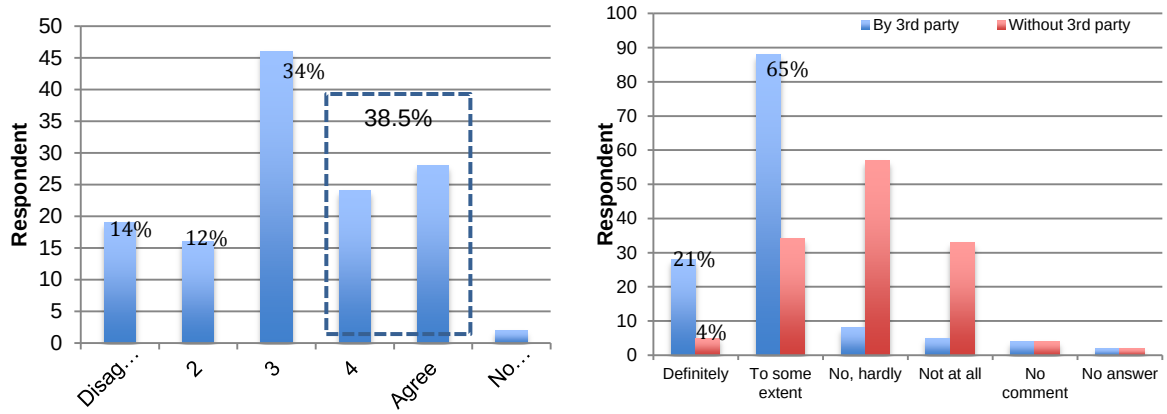


Figure 3.11: *left* Quality of a PWFL product (Q 3.5) *right* Trustworthiness of the PWFL controlled by a third party compared to PWFL controlled by a producer without a third party (Q 3.6-3.7)

3.3.5 The Role of Consumers in Supporting Product Water Footprint Labeling

The last section of the survey questionnaire focused on the role of consumers in sup-porting product water footprint labeling of food and beverage commodities in Thailand. Respondents were asked to assess their purchasing frequencies of both conventional and eco-labeled food and beverage products from six distribution channels, including grocery stores, convenience stores, supermarkets, discount stores, wholesalers, and farmers. In Thailand, particularly in Bangkok, grocery stores are usually family-owned businesses and do not offer customers parking places. These stores are unlikely to be able to compete with others mainly due to their limited budgets. Convenience stores such as 7-Eleven are very popular in Thailand because they offer customers quick meals and other daily-use products. They are open 24 hours per day, and they are located at almost every corner in Bangkok. Their products, however, are sold at slightly higher prices than normal because of their service time. Tops, Foodland, Gourmet Market, and Villa Market are examples of supermarkets in Thailand, which are mainly located in big department stores such as Central, The Mall, The Emporium, and Siam Paragon. Some of them, such as Villa Market, have their own areas, which in most cases provide parking places for customers. These conditions are almost the same with discount stores, except their prices and product quality are lower than products in supermarkets. TescoLotus, Big C, and Carrefour are examples of discount stores. There are not many wholesalers in Thailand. The most well-known wholesaler is Makro, and it is not so practical for individual end consumers to purchase their products, though their prices are seemly lower than supermarket prices. Last, buying food and beverages directly from farmers in fresh markets sounds healthy; however, it is not practical for Bangkokers who work from early morning to late evening. It is appropriate for housewives, restaurants, or people who have flexible work schedules.

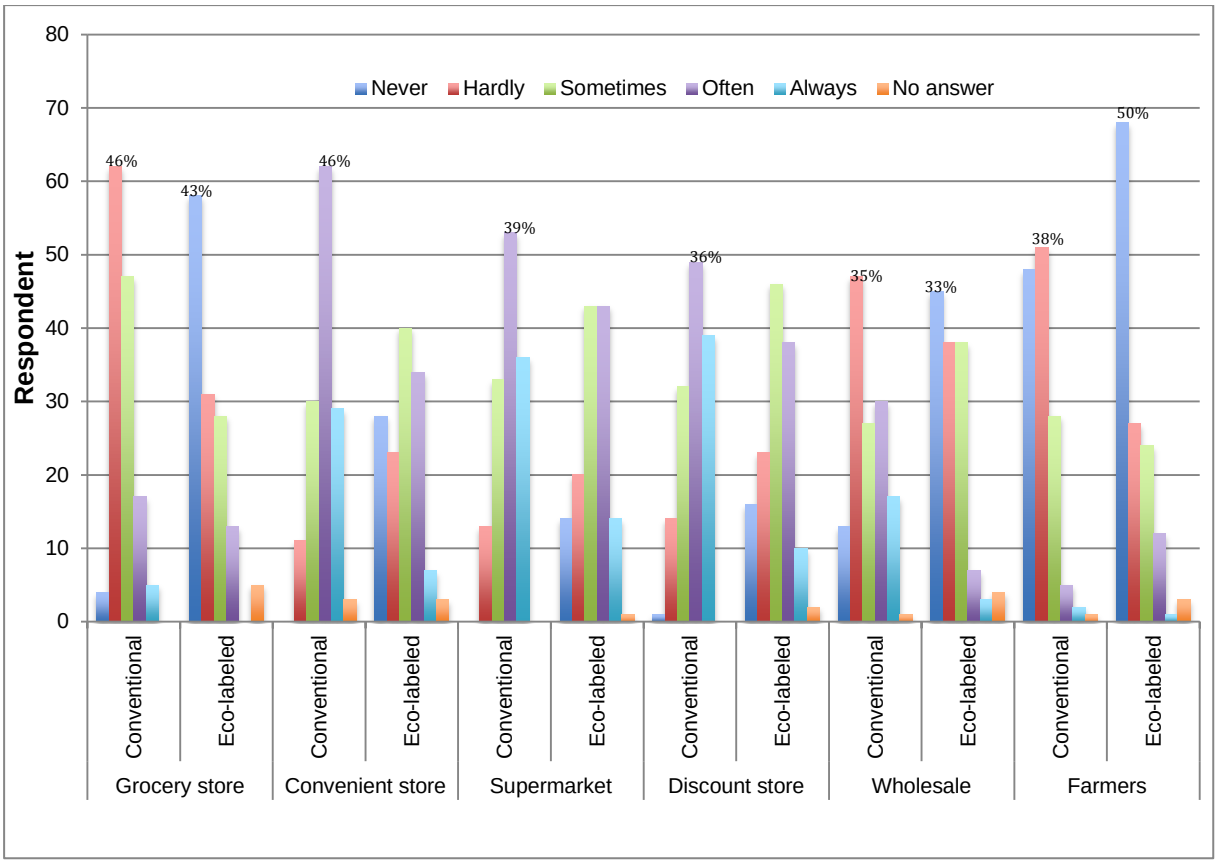


Figure 3.12: Frequency of buying conventional and eco-labeled food and beverage products through various distribution channels (Q 4.1-4.3)

As shown in Figure 3.12, respondents often purchase conventional food and beverage products in convenience stores (46%), supermarkets (39%), and discount stores (36%), whereas they rarely buy them from grocery stores (46%), farmers or producers (38%), or wholesalers (35%). In the case of eco-labeled products, convenience stores, supermarkets, and discount stores still are the main distribution channels; however, purchasing frequencies are much lower. 68 respondents (50%) had never bought eco-labeled products from farmers or producers. 58 and 45 respondents (43% and 33%) had never purchased eco-products from grocery stores and wholesalers respectively. It can be concluded that the potential distribution channels for PWFL products include convenience stores, supermarkets, and discount stores.

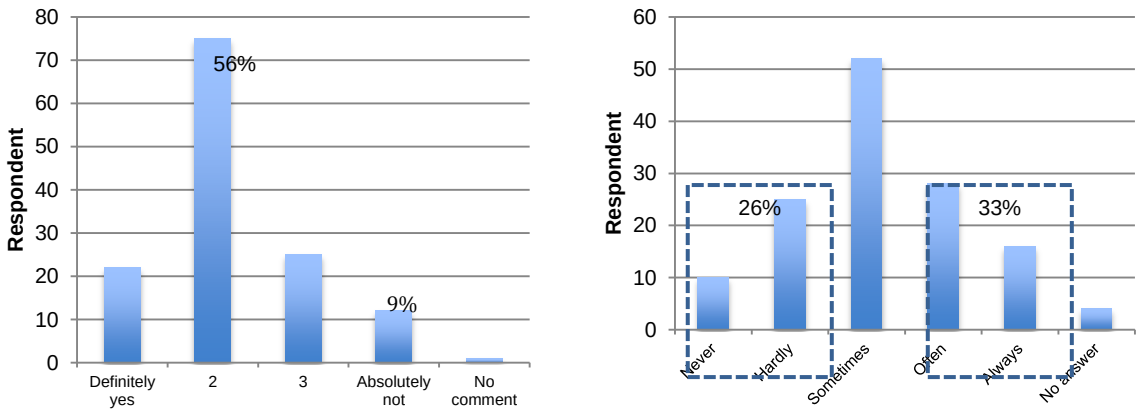


Figure 3.13: *left* Consumers' influence on producers (Q 4.4) *right* Frequency of buying eco-labeled products (Q 4.2)

Respondents were asked whether they, as end consumers, could influence businesses to display water footprints of their products. According to Figure 3.13 *left*, 75 respondents (56%) indicated that they could influence producers to some extent, whereas 12 respondents (9%) said that they could not do it. This finding implies that most respondents believed that they had the power to force businesses to change the way they operate their production. The survey also questioned respondents about how frequently they bought eco-labeled products. Figure 3.13 *right* shows that 39% of respondents said that they sometimes buy eco-labeled products, and 33% reported that they often or always purchased them. In contrast, 26% of them never or hardly ever bought products with eco-labels, such as green labels or carbon labels. Overall, more than 70% of respondents have purchased and used eco-products in their daily lives, and this group might have the potential and ability to buy PWFL products when they enter the Thai-land market.

Linkages between frequency of buying eco-labeled products and respondents' characteristics are thoroughly investigated through cross-tabulation and the chi-square test. SPSS outputs illustrate that there could be no relationship between frequency of buying eco-labeled products and gender, family status, educational background, and occupation of respondents. Surprisingly, there could be no association between frequency of buying eco-labeled products and income per month as well. According to Table 3.10, the critical value is $\chi^2 = 4.361$, thus the null hypothesis that there is no association between buying eco-products and income per month cannot be rejected. This means that the purchasing of eco-products is likely independent from respondent's income. This can be seen in cross-tabulation, which shows that the majority of each income level is on the "Sometimes" line. Based on the sample size of 135 respondents, it might be said that respondents' decisions on purchasing eco-products is probably independent from their income levels. However, further research on factors that influence consumers' buying decision of eco-products are recommended in order to create effective marketing plans for PWFL products.

buying_ecoproducts*income_per_month Cross-tabulation

			Income_per_month				*Total*
			Less than 30,001	*30,001 - 80,000*	*More than 80,000*	*None*	
Buying_Ecoproducts	Hardly	Observed frequencies	12	15	8	0	35
		Expected frequencies	11.9	15.3	7.5	.3	35.0
		% within Income_per_month	26.1%	25.4%	27.6%	.0%	25.9%
	None	Observed frequencies	1	3	0	0	4
		Expected frequencies	1.4	1.7	.9	.0	4.0
		% within Income_per_month	2.2%	5.1%	.0%	.0%	3.0%
	Often	Observed frequencies	14	20	9	1	44
		Expected frequencies	15.0	19.2	9.5	.3	44.0
		% within Income_per_month	30.4%	33.9%	31.0%	100.0%	32.6%
	Sometimes	Observed frequencies	19	21	12	0	52
		Expected frequencies	17.7	22.7	11.2	.4	52.0
		% within Income_per_month	41.3%	35.6%	41.4%	.0%	38.5%
Total		Observed frequencies	46	59	29	1	135
		Expected frequencies	46.0	59.0	29.0	1.0	135.0
		% within Income_per_month	100.0%	100.0%	100.0%	100.0%	100.0%

Chi-Square Tests

	Value	*df*	*Asymp. Sig. (2-sided)*
Pearson Chi-Square	4.361[a]	9	.886

[a] 7 cells (43.8%) have expected count less than 5. The minimum expected count is .03.

Table 3.10: Cross-tabulation and χ^2 test of buying eco-labeled products and income per month

Nevertheless, Table 3.11 shows that there could be a relationship between frequency of buying eco-labeled products and age of respondents. The critical value is $\chi^2 = 13.437$, thus the null hypothesis can be rejected. 15% of respondents who are younger than 35 hardly purchase eco-labeled products, whereas 9% of respondents, aged 35-44, sometimes purchases them. 17% of respondents who are older than 44 stated that they often purchase products with an eco-label. The greatest variation between the observed and expected frequencies occurs in the cells “Less than 35” and “Hardly” buying eco-labeled products. These need further examination.

buying_ecoproducts*age Cross-tabulation

			Age			Total
			Less than 35	*35-44*	*More than 44*	
Buying_Ecoproducts	Hardly	Observed frequencies	20	5	10	35
		Expected frequencies	13.0	7.8	14.3	35.0
		% within Age	40.0%	16.7%	18.2%	25.9%
	None	Observed frequencies	2	2	0	4
		Expected frequencies	1.5	.9	1.6	4.0
		% within Age	4.0%	6.7%	.0%	3.0%
	Often	Observed frequencies	10	11	23	44
		Expected frequencies	16.3	9.8	17.9	44.0
		% within Age	20.0%	36.7%	41.8%	32.6%
	Sometimes	Observed frequencies	18	12	22	52
		Expected frequencies	19.3	11.6	21.2	52.0
		% within Age	36.0%	40.0%	40.0%	38.5%
Total		Observed frequencies	50	30	55	135
		Expected frequencies	50.0	30.0	55.0	135.0
		% within Age	100.0%	100.0%	100.0%	100.0%

Chi-Square Tests

	Value	*df*	*Asymp. Sig. (2-sided)*
Pearson Chi-Square	13.437[a]	6	.037

[a] 3 cells (25.0%) have expected count less than 5. The minimum expected count is .89.

Table 3.11: Cross-tabulation and χ^2 test of buying eco-labeled products and age

This result could assure that age is probably one factor in driving the purchasing of eco-products. Young respondents said that they hardly or sometimes purchased eco-products, whereas respondents older than 34 stated that they sometimes or often bought eco-products. There might, however, be hidden reasons behind this difference. For instance, young people might lack experience and education to understand how eco-products can contribute to environmental sustainability and society, or they are likely to be interested in other products such as Hi-Tech products or fashion goods.

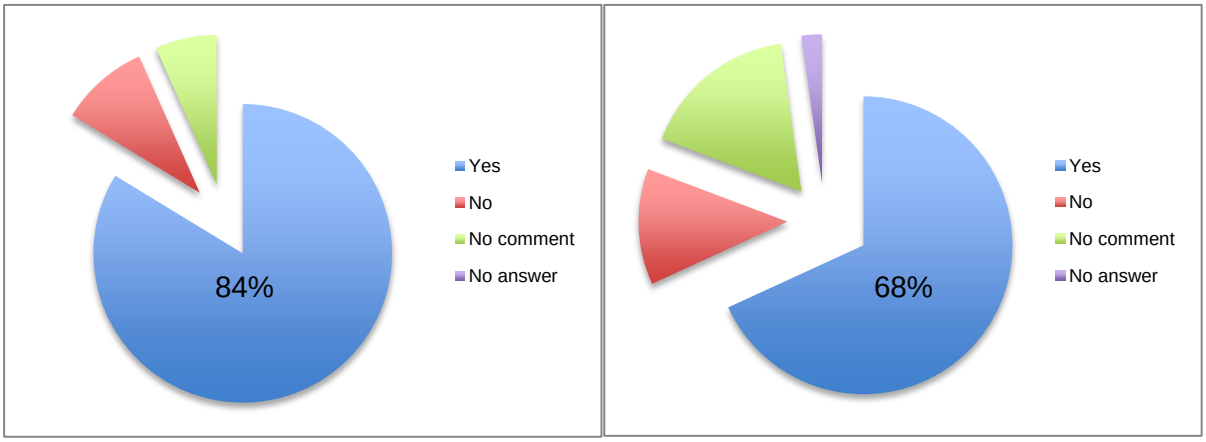


Figure 3.14: *left* Reduce water problems through buying PWFL products (Q 4.5) *right* Recommend that friends buy PWFL products (Q 4.6)

The next question aims to investigate whether or not respondents feel that buying PWFL products can contribute to reducing water problems. Since in order to be certified for a PWFL, businesses must have improved or adapted their production processes into water-friendly ones. As shown in Figure 3.14 *left*, 84% of respondents agreed with the pre-ceding statement, whereas 10% of them did not agree. Figure 3.14 *right* illustrates that 92 respondents (68%) will recommend that their friends buy PWFL products; however, 17 respondents (13%) said that they would not suggest that their friends purchase these kind of products. It can be concluded that most respondents realized that they, as end consumers, could play a significant role in supporting sustainable use of water re-sources in the food and beverage sector in Thailand through their purchasing behavior.

Considering the current situation of consumer awareness of water scarcity, consumer behavior would be a small factor in compelling businesses to rethink the way they use water resources in manufacturing their products. Nevertheless, it should not be under-estimated. If there are sufficient consumers who demand a PWFL on their food and beverage products, then visionary businesses will tend to respond by trying to fulfill consumer demand through implementing water-friendly production processes.

3.4 Summary of Finding Results

The most crucial factor in designing an eco-label is striking a balance between animation and information. As mentioned earlier, respondents preferred an absolute amount of water footprint of a product over other choices. This label is displayed together with the absolute amount of global average water footprint of the same product, on an image of the earth in a water drop (choice A). Nonetheless, this format displays insufficient information due to the aggregated figure of water footprints. As a result, a more appropriate format and logo for the PWFL were designed, which is already explained in Section 2.

Willingness to pay for PWFL products ranges from 0-30% markup price. The highest markup price of PWFL products up to 30% is affordable for one kilogram of PWFL rice; 20% is possible for 10 PWFL eggs; and one kilogram of PWFL chicken meat. However, with respect to information collected by conducting in-depth expert-interviews, prices should stay at the same level in order to be sold domestically. This is the case with carbon-labeled products that are sold at the same price as conventional products. A representative from CPF suggests that in Thailand, PWFL products should be the same price or even cheaper. However, for exports a 10% markup in price is expected.

With respect to SPSS output, the monthly income of the target group should be considered in designing the logo and format of PWFL. There is no sensitivity to WTP among the four products, and further research on WTP for PWFL products is recommended in order to prepare sound pricing strategies for PWFL products. Financial constraints may have an influence on

interest in eco-labeled products, and age is probably one factor driving the purchasing of eco-products.

Respondents are aware that water is a finite resource and they realize that there is a link between water shortage and food security, although they have never faced severe water scarcity that caused food inadequacy in Thailand. There is a misperception about how much water is consumed by the agricultural sector, since respondents estimated that only 40-60% of global water resources is used by that sector, when in fact, agriculture consumes about 60-80% of global water resources. This can be used to guide public perception that if Thailand faces water scarcity, not only the industrial sector, but also agriculture should be focused on and participate in reaction plans. Water problems in Thailand are rated as highly important, which was also perceived to have a significant effect on respondents' personal lives. Respondents expressed that taking responsibility for causing and solving water problems are included in assignment of the industrial sector and the Thai government. Nevertheless, respondents felt that participation in solving water problems is considered as consumers' engagement. Most respondents have an average interest in eco-labels on products, and in turn this has average influence on their purchase decisions. They perceived that a PWFL on a product shows that a business has already improved or adapted its production process to use less water, which implies that the business is socially responsible. Nevertheless, they make erroneous assumptions about the quality of PWFL products, since the label only indicates that the products were manufactured through a water-friendly production process. Third party certification is required in order to gain trustworthiness from consumers. Recommended distribution channels of PWFL products include convenience stores, supermarkets, and discount stores because most respondents who sometimes buy eco-products claimed that they have purchased them from these three distribution channels. Respondents believed that they could influence businesses to change to water-friendly production to some extent. They agreed that reduction of water problems could be encouraged by their purchasing PWFL products since businesses have to change their production processes in order to be certified and labeled. Finally, they are also willing to suggest that their friends buy PWFL products as well.

Although implementation of eco-labels is widespread, research concerning its impact and effectiveness is limited and aggregate quantitative results are rare (Teisl, 2007).

4. BUSINESS MOTIVATION FOR PRODUCT WATER FOOTPRINT LABELING

The business world is waking up to the inevitable and unavoidable truth that the economy and the environment are deeply intertwined. All goods depend on the bounty of nature and the services it provides. Without careful stewardship, natural resource constraints will interrupt a growing number of companies and industries (cf. Esty & Winston, 2006). The World Economic Forum (WEF) stated, "Worsening water security will soon tear into various parts of the global economic system." The bursting of these bubbles will increasingly impact trade, food production, and regional security. By 2030, according to the UN, nearly 50% of the world's population will experience water shortages, and the shortages will force an estimated 55% of the world's population to depend on food imports. Assuming that energy production accounts for a significant amount of water demand, the effects of the shortage will be multiplied rapidly. Global water scarcity is one emerging risk on which all companies should focus. A range of studies, including the Intergovernmental Panel on Climate Change's 2008 Climate Change and Water report, have concluded that climate change is likely to exacerbate water scarcity. In fact, climate change coupled with a growing global population, economic development, and more water-intensive consumption patterns in emerging markets, will further affect water availability, quality, and demand in ways that present material risks for many companies and their stakeholders (cf. Ceres, 2010).

As businesses seek to secure long-term prosperity, to maintain competitive advantage and brand differentiation, and to secure stability and choice in supply chains, increasing water scarcity presents physical, reputational, legal, and financial risks. First, there is the physical risk that companies may face freshwater shortages affecting their supply chain or operations. Second, the corporate image of a company may be damaged if the public and media raise questions about the sustainability and equity of its water use. Water depletion or pollution problems in the supply chain or operations and a lack of mitigating strategies constitute a reputational risk for companies. Third, triggered by the wish to achieve a more sustainable and equitable use of scare freshwater resources, governmental interference and regulation in the area of water use will undoubtedly increase. Each of the three risks mentioned above may translate to a financial risk in terms of either increased cost or reduced revenues or both (cf. Hoekstra et al., 2011). Those emerging risks will impact environmental, social, and governance issues and should be considered in financial filings (cf. Ceres, 2010). The type of business will determine the level and exposure to risk and the appropriate response. Heavily water-dependent businesses will face challenges and uncertainty due to the increasing scarcity of water. Water-intensive food and beverage businesses are especially vulnerable, both in their operations and their extensive supply chains. They will face hard strategic choices in order to survive (cf. Ceres, 2010; Hujsak, 2011; Orr et al., 2009). As a consequence, ensuring safe and adequate freshwater supplies for future generations and the global economy is more important than ever. Businesses have an integral role to play in meeting this global challenge, which will in turn help to secure their future prosperity (cf. Ceres, 2010). The following paragraphs will demonstrate risks and opportunities for businesses in the food and

beverage sector, with examples from international companies as well as empirical evidence collected from Thailand.

4.1 Environmental Pressure

Too little water, too much water, and unusable water are related physical risks. Water scarcity, flooding, and water pollution are associated with management of water resources. Even where water is readily available, physical risk can emerge from poor management of the resource. Water is an irreplaceable resource. Therefore, businesses suffer when they run out of it. In 2002, Swiss Re[35] reported an increase in claims against "business interruption cover" as a result of periodic water shortages, suggesting that the problem had become more severe (Orr et al., 2009). There is every reason to believe that this risk will only increase in the future, as demand for water from other users increases. The effect of climate change, including drought, heat waves, and reduced water flows from melting glaciers, will only aggravate water scarcity (cf. Ceres, 2010).

4.1.1 Unsustainable Supply

All water users: domestic, industrial, and agricultural, have been consistently withdrawing more water than the natural hydrological cycle's renewable capacity (Orr et al., 2009). Functional freshwater ecosystems provide several functions. First, they provide services and products, such as freshwater, fish, and transport routes. Second, they offer regulating or ecosystem services, such as water purification, stream flow mediation, and options for adaptation to changes such as those caused by warmer climates. Third, they bestow cultural services, such as aesthetic beauty, spiritual significance, and heritage value on which society depends (Orr et al., 2009). The first function refers to the economic benefit of water, the second function shows that water sustains the environment and ecosystem, and the last function demonstrates the social advantages derived from water resources. It is difficult to assess the cost for some of these services (cf. Rogers et al., 2008) and therefore, they are underemphasized in cost-benefit analyses, risk assessments, and other decision-support processes. This is not a separate issue from economic growth and social stability. Rather, it is a crucial consideration in delivering clean water, allocating water for food production, and providing other ecosystem services to an increasing thirsty world (cf. Orr et al., 2009).

In many countries, irrigation systems have been subsidized. This has weakened price signals, tempting farmers and businesses to take too much water from rivers, over-pump groundwater, and generally waste freshwater resources (government failure) (Bischoff, 2008; United Nations ESCAP, 2009). Globally, 15-35% of total water withdrawal for irrigated agriculture is estimated to be unsustainable, which means that the use of water exceeds the re-

[35] Swiss Reinsurance Company Ltd. (German: Schweizerische Rückversicherungs-Gesellschaft AG) is a Swiss reinsurance company. It is the world's second-largest reinsurer, after having acquired GE Insurance Solutions. The company has its headquarters in Zurich. Founded in 1863, Swiss Re operates through offices in more than 25 countries.

newable supply. In Asia and the Pacific, this intensive withdrawal has depleted aquifers, particularly in Central Asia,[36] South Asia, and China. It has also reduced the flow of major rivers like the Ganges in India and Bangladesh, the Yellow River in China, the Amu Darya and the Syr Darya in Central Asia, and the Chao Phraya in Thailand (United Nations ESCAP, 2009). In Northern China, surface water sources, including major rivers, are rapidly drying up. The Yellow River, the second largest river in China and the sixth longest in the world, is experiencing the worst water shortage in recorded history because its water flow dropped 5.5 billion m^3 between 1997 and 2003. Over the last 40 years, the water levels of major aquifers in China have fallen, in some cases by 50-90 meters, which has resulted in the infusion of salt water, causing further damage to the already declining aquifers. Furthermore, climate models denote that the conversion of forest canopy to grasslands will cause a decrease in rainfall of up to 50%, due to a variety of complex effects involving wind, temperature, thermal transfers, and the loss of evaporative transpiration of trees, which supplies the moisture for rain (Hujsak, 2011). A recent study predicted that El Nino Modoki[37] is likely to increase the frequency and intensity of droughts in India. In March 2009, a Purdue University study forecasted that climate change has produced both the weakening and delay of monsoon seasons in India, Bangladesh, Nepal, and Pakistan. This was further reinforced by an analysis of NASA satellite data collected between 2002 and 2008, which revealed that India's aquifers were diminishing at a dangerous rate and predicted a complete collapse of the agricultural system if conditions did not change (Hujsak, 2011).

The overwhelming weight of evidence indicates that many of the world's most water-stressed areas will get less water and water flows will become less predictable and more subject to extreme events. For instance, Thailand faces rising sea levels, which lead to freshwater losses in the river delta systems (UNDP, 2006). Despite excess water supply as mentioned in Section 2, Thailand has begun to experience water shortages in some areas and periods. The Interior Ministry classified an estimated 28,435 villages, mainly in the northeast region, as drought-affected villages. In addition, insufficient water supply is reported repeatedly in several central plain areas, especially where there is a high demand for water for agriculture, tourism industries, and manufacturing. The water shortage was worsened by competing water intake among all users. This caused a shortage in the tap water system for urban dwellers as well as an intrusion of sea water into river delta areas, destroying farmlands along the rivers in the lower central plane region (United Nations ESCAP, 2002).

Not only developing countries, but also developed countries are facing water crises. Pressures related to water availability are growing in the U.S. and the EU, making numerous industries vulnerable to water disruption throughout their operations and supply chains (cf. Ceres, 2010). For instance, the water level of Lake Mead in the Southwestern U.S., the source of water for the Hoover Dam hydroelectric generators in Nevada, has been dropping at a steady rate of more than three meters per year since 1999 owing to climate change. If

[36] A case of the Aral Sea is presented in Section 5.
[37] A new form of El Nino weather events

the water level continues to drop, the Hoover dam will face serious production cutbacks or outright shutdown as early as 2013. This situation has already forced Nevada to begin planning a 250-mile, multi-billion-U.S.-dollar pipeline that will bring water from distant underground aquifers to Las Vegas (Hujsak, 2011). Aquifer depletion is also starting to occur in countries such as Spain and Portugal, and according to predictions by the European Environment Agency (EEA), southern Italy, Greece, and Turkey are also at risk in the future as the temperature rises.

A lack of freshwater can limit business activities, raw material supplies, and product use in a variety of ways (cf. Grobbel et al., 2010). Dr. Aldaya questions what a brewery can do without a secure water supply or how a jeans company can survive without a continual supply of water for cotton fields. Declines or disruptions in water supply can undermine industrial operations where water is needed for production, irrigation, processing, cooling, and cleaning. Water supply risks are often hidden in companies' raw material inputs or in the inputs of intermediate suppliers. The world's second largest beer retailer and brewing company, SABMiller, for example, found that the water footprint of its grain procurement in South Africa accounted for 98% of the total water used to produce a single liter of beer. The Australian beverage industry was exceptionally hard hit by the country's 2006-2007 drought. Winemakers saw production losses of 28%, and in order to meet irrigation demand, several Australian wine and beer companies purchased water on the open market for the first time (cf. Ceres, 2010), which increased the production costs. In South Africa, SABMiller was forced to halt production at one of its plants in 2007 due to water shortage (Orr et al., 2009), resulting in a loss of revenue. In the same year, a combination of drought and floods in grain-growing regions, coupled with rising demand, lead to a significant increase in the price of wheat. This in turn resulted in higher costs for the numerous food companies using wheat as a raw material or ingredient, which impacted the price of many final food products (Olofsdotter, 2008). Between 2008 and 2010, water shortages in California forced farmers to abandon or leave unplanted more than 100,000 acres of agricultural land, resulting in more than one billion U.S. dollars of lost revenue (Ceres, 2010).

Beverage companies also face risks related to the availability and price of agricultural inputs to the degree that changing weather conditions and drought affect the size or quality of agricultural production, particularly if crop production cannot be easily shifted. Global sugar prices have reached a 28-year high due to lower production in India, the world's second largest sugar producer. Drought in India led to a 2008 sugar crop yield 45% lower than the previous year, and the 2009 and 2010 harvests were expected to yield similarly low levels (cf. Ceres, 2010). In contrast, Mrs. Kimsri states that CPF does not have or face severe water shortages or scarcities that affect its performance. The only shortages occur in dry seasons. The company solves by preparing water use for dry seasons during the wet seasons through its own water management. CPF has had to buy water sometimes, but it has been insignificant. Overall, CPF does not have problem with water scarcity.

4.1.2 Contamination of Water

Clean water is critical to many industrial processes and a lack of it can present a range of costs to companies. A contaminated water supply often requires additional investment and costs for pre-treatment. When alternative source water or treatment options are not physically or financially feasible, operations may be disrupted or require relocation. Industrial expansion may also be constrained in regions where the water supply is already contaminated or at risk of contamination. Downstream surface and groundwater quality can be severely affected by run-off linked to the use of agricultural inputs such as pesticides, herbicides, and nitrogen fertilizers. Eutrophication[38] has created over 415 aquatic "dead zones" around the world, characterized by oxygen depletion and harmful algal blooms (Ceres, 2010). The lack of wastewater treatment technology results in the dumping of untreated waste into waterways, polluting drinkable water sources, and wasting precious water that could be treated and recycled. Roughly half of Europe's wastewater is not treated before discharge, which leads to contaminated surface and ground water resources (Hujsak, 2011).

In China, many rivers are so badly polluted that industry cannot use the water, and nearly two-thirds of the country's largest cities have no wastewater treatment facilities (Ceres, 2010). In Thailand, water pollution is so severe that rivers often contain 30-100 times the pathogen[39] load permitted by health standards (UNDP, 2006). Of the 25 river basins in Thailand, almost all are subjected to the industrial sector, and the water is so highly toxic that it is not suitable for agricultural purposes. An estimated 70% of applied pesticides is washed away and leaches into the soil and water, resulting in excessive pesticide residue contamination in the local ecology and food chain. Some of the pesticides may break down into less dangerous chemicals which can be absorbed by the environment. Nonetheless, there are many pesticides that are highly stable and can be hazardous for a long period of time. Therefore, it is not surprising to find a large amount of land and water in Thailand contaminated with pesticides (United Nations ESCAP, 2002). The food conglomerate CPF has to treat water from all sources in order to meet food safety standards in its production processes. As a result, a giant water treatment system was built. For beverage makers that rely on large, global networks of bottling plants, access to high quality freshwater is also essential to maintaining the quality and safety of products.

[38] Eutrophication is the addition of artificial or non-artificial substances, such as nitrates and phosphates, through fertilizers or sewage, to a fresh water system, i.e. the primary productivity of the water body. In other terms, it is the "bloom" or great increase of phytoplankton in a water body.

[39] The body contains many natural orders of defense against some of the common pathogens in the form of the human immune system. Some pathogens (such as the bacterium Yersinia pestis which may have caused the Black Plague, the Variola virus, and the Malaria protozoa) have been responsible for a massive numbers of casualties and have had numerous effects on afflicted groups.

4.2 Demographic and Economic Drivers

All too often, rain comes as a severe flood or not at all, making its capture and storage difficult and it distribution uneven. The Atacama Desert in northern Chile may go for more than 20 years without rain, whereas Mount Waialeale on Kauai in the Hawaiian Islands averages more than 12 meters of rain per year. Perhaps most important, the growth of the global population has not followed the rain (cf. The Coca-Cola Company, 2010). Water demand is increasing worldwide, especially in developing countries where economic and population growth is overburdening (cf. Ceres, 2010). By 2030, the earth's projected eight billion inhabitants will need 25% more freshwater. Approximately 90% of this population growth will take place in developing countries, where demand on water resources is already high and supplies are limited (cf. Black et al., 2009; Ceres, 2010; WWF, 2009). More water is demanded for increased production and improved standards of living. This includes such products as power showers, high-pressure car hoses, and dishwashers. As countries become wealthier, they are likely to shift to more water-intensive diets and commodities (cf. Black et al., 2009; Hujsak, 2011; Wales et al., 2010; WWF, 2009).

Currently, trends indicate that China will soon change from a net exporter to a net importer of food as a direct result of the water crisis and as part of a response plan to preserve the country's water resources for other uses. The population of China is also expected to grow to 1.5 billion by 2030, with much of this growth in urban areas where per capita water consumption is far greater than in the countryside. The significantly increasing migration to urban centers makes the situation more severe (cf. Hujsak, 2011; Liu & Savenije, 2008). Changing of consumption patterns also put pressure on water resources. The consumption of water-intensive red meat in large developing countries such as India and China has risen 33% in the last decade, and is expected to double globally between 2000 and 2050 (Black et al., 2009; Ceres, 2010). This claim is supported by the research of Liu and Savenije (2008), which finds that the per capita water requirement for food in China has more than tripled from 1961-2003, due to an increase in the consumption of animal products in recent decades. This evidence confirms the fact that water footprinting can show the pattern of water use as well as the hidden link between water resources and food production. The scenario analysis also indicates that the future total water requirement for food will likely continue to increase in the next three decades.

As commercial farming has grown over the last century, it has become less dependent on rainfall and more dependent on irrigation, which now pulls vast amounts of water from underground aquifers as available surface water sources decline (cf. Black et al., 2009; Hujsak, 2011; Wales et al., 2010; WWF, 2009). For example, owing to demand from foreign countries, many farms in India have shifted to water intensive crops such as rice, wheat, and cotton, which worsen the water situation in India. Both agriculture, which is responsible for 70% of the world's freshwater use each year, and industry need water to grow. The power industry uses 22% of the world's water supply and 30% of the freshwater in the U.S. Unfortunately, those numbers are rapidly rising (cf. Hujsak, 2011; Wales et al., 2010). Last, deforestation

for much needed resources contributes to the damage of ecosystems and watersheds that maintain the cycle of water production in the environment (cf. Hujsak, 2011).

4.3 Consumers' Expectations

If one had walked into a supermarket 15 years ago, one would have been hard pressed to find many products labeled with their ecological or ethical credentials. Eco-labeled or fair-trade goods were generally sold in small charity shops rather than in the big chains, and organic fruit and vegetables were still very much in their infancy. One had to be something of a green aficionado to seek out a more sustainable choice and to pay the premium price required. While not everyone will scrutinize the ingredients list of everything they buy or scrupulously select only fair-trade or eco-products, more and more consumers want some reassurance that the companies they are buying from are doing the right thing (Wales et al., 2010). The first great boom of consumer awareness on environmental issues was in the 1980s, when societal debates as diverse as saving the whales, eliminating animal testing on cosmetics, and reducing the wasteful grain mountains, wine lakes, and butter vats resulting from European agricultural subsidies all hit the press regularly (cf. Busse, 2006; Wales et al., 2010).

Today, the eco-friendly characteristics of products have become steadily more important to consumers in western countries, and companies have responded by placing eco-labels on their products that highlight the items' environmental attributes and by introducing new or redesigned eco-friendly products (cf. Teisl, 2007). For example, CPF in Thailand has recently launched carbon-labeled products such as chicken teriyaki, chicken meat, [12] and snacks for dogs. About 10 products, such as chicken Bar-B-Q and chicken Noriyaki, are waiting for certification of the carbon label in March 2011. Labeling initiatives such as the nutritional traffic-light labeling scheme were developed. Consumers are being educated about which foods might be better for them, enabling them to make healthy choices (cf. Farnworth et al., 2008; Schmid et al., 2005). It is true that consumers are not always willing to pay more for products, but they may avoid products that they feel are not ethically produced, or boycott businesses that do not address the issue. Businesses in the food and beverage sector are required, expected, or even obligate to provide correct information about their products (cf. Busse, 2006; Nordic Council of Ministers, 2008). Currently the greatest focus for companies in the seafood industry is complying with certification requirements to meet the demands of consumers and buyers in developed countries (cf. Nordic Council of Ministers, 2008).

In terms of the water footprint, Dr. Aldaya comments that nearly every product has a smaller or larger water footprint, which is of interest to both consumers that buy the product and businesses that produce, process, trade, or sell the product. Through the development of the Internet in recent years, consumers have had unlimited access to enormous amounts of information at the push of a button and in most cases for free (cf. Busse, 2006). As a result, it

is not easy for businesses to sweep their negative impact on the environment and society under the carpet.

Public interest in pressing environmental and social challenges is growing fast. Opinion surveys show rising awareness of the issues matched by an increasing demand for eco-friendly products (cf. Schumacher, 2010; Wales et al., 2010). They have shown that many consumers are likely to choose one brand or product over another if they believe that it will help the environment or, in some cases, create justice. According to a study by Jha (1993), slightly over half of the consumers in North America have purchased a product that they felt was better for the environment, boycotted a specific product that they felt was bad for the environment, or boycotted products made by a company that they felt was damaging the environment (Teisl, 2007). In a national survey of U.S. seafood consumers conducted by Wessels, Johnstons and Donath (1999), found that there is at least a hypothetical demand for eco-labeled salmon, cod, and shrimp, and consumers are willing to pay a premium price for this kind of labeled product if the eco-label implies a prohibition against overfishing (MRE Foundation, 2000). In 2006, a study by the National Consumer Council of the UK found that household spending on ethical goods and services has almost doubled in the past five years. The overall ethical market in the UK is now worth 32.3 billion pounds a year. The degree to which concerns are translated into purchasing power matters: although 30% of consumers consider “ethical” issues when they decide what to buy, actual sales figures show that only 3% act on these concerns. In 2007, a recent survey of consumer behavior by the Co-operative Bank noted that 6% of the UK adult population (2.8 million people) are committed consumers of ethical products and services; up from 5% in 2003. These consumers shop for ethical products on a weekly basis and spend an estimated annual 1,600 pounds per household on ethical food and drink. Committed ethical consumers tend to be between 30 and 44, relatively wealthy, and equally representative of men and women. Market research funded by the Department for International Development (DFID) showed that 64% of people in the UK feel that they can help people in poor countries to lift themselves out of poverty by using their purchasing power carefully and selecting products that have been sourced from developing countries (Ellis & Keane, 2008). 34% of consumers in a recent Boston Consulting Group survey said that they systematically look out for and often purchase eco-friendly products. 75% or more of the consumers in 10 countries, including the U.S., China and a selection of European economies, thought it was “important” or “very important” that companies have high ecological and ethical standards and provide information on their environmental and social impact (cf. Wales et al., 2010).

In a PepsiCo case study in Asia, about 70% of the company’s consumers confirmed that environmental sustainability is important and that a company has to play a role in promoting sustainable practice along its supply chain (cf. Bena, 2008). Additionally, demand for eco-friendly products is still rising despite the economic downturn (cf. Wales et al., 2010). This claim is supported by the case of fair trade coffee, though it is an ethical, not an eco-friendly product. Fair trade coffee in 2003 accounted for only 1% of the world coffee market. In the U.S., the fair trade market currently accounts for over 4% of the specialty coffee market and

nearly 2% overall (Basu & Hicks, 2008). Sales of fair trade coffee still performed steady and strongly during the 2008-2009 economic downturn. [13] Similarly, TransFair, the german fair trade organization, claimed that sales of Transfair-labeled products of 2006 increased 50% from the previous year. Particularly, sales of Transfair-labeled bananas had grown three times within the year 2006 (cf. Spiller et al., 2008). Many commentators see this growing demand as a powerful force for change in consumer behavior (cf. Wales et al., 2010).

However, Mrs. Kimsri believes that Thai consumers still do not have a clear demand for eco-labeled products. CPF participation in the carbon labeling project was triggered by environmental concerns, which by chance, coincided with demand from European countries. EU consumers were already interested in carbon labeling, and retailers such as Tesco and Wal-Mart, have more or less instituted a carbon footprint campaign and requested carbon footprint information for products from their suppliers. She concludes that demand for carbon labeling comes from CPF's primary customers, retailers in the EU, and secondary customers, EU end consumers. If consumers in foreign countries requested water footprint information, CPF would probably launch PWFL products in order to fulfill their demand. Mrs. Kimsri states that need or demand is the main factor in the launch of a PWFL; however, that demand does not necessarily have to come from end consumers. It could come from foreign countries who might request water footprint information, as in the case of the carbon footprint. Unexpectedly, there are currently some Thais asking TGO what the water footprint is and how to calculate it. Dr. Lohsomboon explains that in Thailand businesses are motivated by the demand for carbon footprint information from suppliers abroad. For example, there was a case involving a chewing gum producer from the U.S., which imports synthetic sweeteners from Thailand requesting such information. Thai exporters had no option, but to provide the information. If they did not respond to the request, they would have been replaced as the supplier. The United Nations Conference on Trade and Development (UNCTAD)[40] also claimed that, at the national level, most developing countries generally undertake eco-labeling due to demands in the importing countries. The export orientation of an industry can itself be a driving force that makes the practice of eco-labeling an attractive option through perceived trade gains via a green premium (Carambas, 2005).

[40] The United Nations Conference on Trade and Development (UNCTAD) was established in 1964 as a permanent intergovernmental body. It is the principal organ of the United Nations General Assembly dealing with trade, investment, and development issues.

4.4 Retailers as a Catalyst

Retailers are major players in the food and beverage market. The U.S. supermarket, Wal-Mart, has 2% of the global food market. Five supermarket groups now control 28% of the European food market, and 85% of the UK food market is shared among the five top retailers (cf. Woodhouse, 2007). They have significant power to influence the food supply chain and mitigate negative impact on the environment and society. Wal-Mart is a truly global-scale business. In addition to its stores in the U.S., it operates 7,800 stores in South America, Europe, China and India. It employs two million people around the world and serves customers 200 million times weekly. It also has more than 100,000 suppliers worldwide, so company decisions to change what it buys, such as requiring its suppliers to meet certain standards, have important effects. The absolute scale of Wal-Mart's transformation potential was made evident in its huge China Sustainability Summit, held in Beijing in October 2008. Over 1,000 local suppliers joined with Chinese officials and NGOs to discuss a series of aggressive goals in order to build a more sustainable supply chain. Wal-Mart announced its goal of improving energy efficiency by 20% in the year 2012 to the top 200 factories in China and communicated that it would prefer suppliers who share Wal-mart's ambition of driving sustainability practices (cf. Wales et al., 2010).

The carbon label on food products can be compared to the PWFL. Despite the fact that carbon labeling is still in its infancy, it already allows a degree of differentiation between products. Tesco, for example, shows the different carbon footprints of two sorts of orange juice: fresh and long-life. It also shows that the carbon footprint of Coke sold in a can is half that of Coke sold in a glass bottle (cf. Wales et al., 2010). At the beginning of 2007, Tesco announced that it would put carbon labels on 70,000 food products distributed in its stores to provide information to consumers about the climate impact of products. In September of the same year, Wal-Mart announced a partnership with the Carbon Disclosure Project (CDP)[41] to assess and measure the energy footprint of its suppliers. Carrefour, the largest French retailer and the second largest retailer in world behind Wal-Mart, is also working in collaboration with different companies, including TCCC, Danone, Kraft, and Nestlé, as well as with public institutions, to identify and test solutions to reduce emissions in the food supply chain. In order to shift to low carbon products, retailers put pressure on their suppliers, including all businesses in the food and beverage sector, to reduce the carbon and energy footprint of their products. Head of Environmental Affairs of dairy giant, Arla Foods of Denmark, stated that pressure from retailers, in particular from the UK, is one of the main drivers for the company to initiate activities aimed at climate impact reduction of Arla's products. TCCC's involvement in climate labeling initiatives is also motivated by retailers' requirements. Though it is actively involved in climate impact reduction activities, Danish Crown, a major world producer and exporter in the meat industry, is not willing to participate in the climate labeling initiative at that moment. Nevertheless, it would participate if retailers required it to do so (cf. Olofsdotter, 2008). Finally, as mentioned earlier, CPF is also driven by retailers' demand to participate in the carbon labeling project of Thailand. CPF affirms that retailers aboard can

[41] The Carbon Disclosure Project (CDP) is an organization based in the United Kingdom, which works with shareholders and corporations to disclose the greenhouse gas emissions of major corporations.

have an influence on their operations, though Thai retailers have applied no such pressure. Furthermore, with respect to product water footprint labeling, CPF would surely conduct water footprint accounting if big retailers like Tesco, Carrefour, or Wal-Mart requested such a label, which they do not currently.

In 2008, the UK food safety issues showed that retailers such as Ahold, Carrefour, Marks and Spencer, Metro, Sainsbury's, Tesco, Waitrose, and Wal-Mart could be trend leaders. These retailers set requirements that were followed by many other retailers. They are constantly bringing new products to market and offering their customers new food experiences. While some of this food may not be considered the best ethical or nutritional examples, this approach provides opportunities to find new sources of supply and new ways to support producers (cf. Farnworth et al., 2008). A price premium for products with specific attributes also incents retailers to offer their consumers sustainable products. As a result, international retailers are known to require documentation from their suppliers, so called business-to-business certification or contracts, as part of ensuring that the delivered products have the attributes required by the purchaser. Assuming that many of the global or large retailers are using sustainable seafood products as part of their eco-friendly product profiling, the drivers from the retailer level are such that they will occur without consumer demand in all countries (cf. Nordic Council of Ministers, 2008).

4.5 Investors as Drivers

Not only does consumer activism affect consumption demand for goods labeled as eco-friendly, but it is also reflected in some investment choices, as exemplified by the Socially Responsible Investing (SRI)[42] Principles. As of July 3, 2000, British pension funds have been required by law to disclose whether they will take account of the environmental, ethical, and social impact of their investments (Teisl, 2007). That impact is progressively being seen as an essential part of the fiduciary duty of institutional investors. Fulfilling this duty requires companies to disclose material Environmental, Social, and Governance (ESG) information in the 10-K filing in the U.S. and in annual financial reports in the rest of the world (Ceres, 2010). Employees, shareholders, insurers, banks, and investors would like to know how companies they own are assessing and disclosing water risks and related performance information, since anything that affects a company's business model, such as water shortage or water pollution, can also affect the company's financial performance and valuation (cf. Olofsdotter, 2008; Ceres, 2010). To make informed investment decisions, investors require strong corporate disclosure of the material risks and opportunities of businesses (Ceres, 2010). To date, over 40 banks have signed on to the Equator Principles,[43] which demand

[42] Socially Responsible Investing (SRI) is a broad-based approach to investing that now encompasses an estimated $3.07 trillion out of $25.2 trillion in the U.S. investment marketplace today. SRI recognizes that corporate responsibility and societal concerns are valid parts of investment decisions. SRI considers both the investor's financial needs and an investment's impact on society. SRI investors encourage corporations to improve their practices on environmental, social, and governance issues.

[43] The Equator Principles (EPs) are a voluntary set of standards for determining, assessing, and managing social and environmental risk in project financing.

thorough environmental reviews before loans are approved. But the Principles are just the starting point. Citibank, Goldman Sachs, JPMorgan, and many others are wrapping environmental considerations into lending decisions in dramatic new ways. ABN AMRO, one of the founders of the Equator Principles, has developed a new way of looking at its portfolio of loans. It charts borrowers on a classic two-by-two matrix, with capacity to handle and mitigate environmental risks on one axis and commitment to do so on the other. In the near future, ABN AMRO hopes to graph all potential loans against these criteria.

From an investment perspective, water is the world's most stable commodity, and in general not affected by business cycles, inflation, recession, or interest rates. The water market is a growth market because it is a commodity that has no substitute. It touches a great quantity of related businesses that support the production, monitoring, testing, and distribution of the precious resource (Hujsak, 2011). Institutional investors are progressively seeking information from companies on how they are addressing and managing material water risks and opportunities. In August 2009, Norges Bank Investment Management (NBIM), which runs the 415 billion U.S. dollars Norwegian Government Pension Fund, announced that it would begin evaluating the water risk management practices of the 1,100 companies it holds. In November of the same year, the CDP launched a new investor-driven water disclosure initiative backed by European and U.S. investors, focused on 300 of the world's largest companies. Through Ceres' Investor Network on Climate Risk, over 40 institutional investors have asked regulators, including the U.S. Securities and Exchange Commission (SEC), to provide better guidance to companies on disclosure of key ESG issues, including climate change and water scarcity. As a consequence, on January 27, 2010, the SEC issued guidance that clarifies what publicly traded companies need to disclose to investors in terms of material climate-related risks and opportunities. Regarding water issues, it covers reduction of agricultural production capacity in areas affected by drought or other weather-related changes. The SEC also notes that significant physical effects, such as the arability of farmland and water availability, quality, and usage, have the potential to affect a registrant's operations and results. Likewise, a report of Sustainable Development Management states that water consumption and efficiency are used as Key Performance Indicators (KPI) for beverage products (cf. Hesse, 2010).

Shareholders and other key stakeholders have steadily higher interest and expectations regarding companies' proactive management of water issues as well. Their associated risks have also been posed to a wide range of market participants. As a result, more than financial statements are required to value an investment (cf. Ceres, 2010). With respect to Thailand's current circumstance, Thai investors are interested in transparency in information disclosure, social corporate responsibility, financial risks, and most importantly, in companies' profit. Though investors or shareholders do not directly require the PWFL, as discussed in Section 2, product water footprint labeling includes water footprint accounting, which provides information demanded by investors and banks. For instance, environmental risks related to grey and blue water, including water shortage and wastewater, can be evaluated to some degree, as can possible social conflicts, which could satisfy requirements for environmental consid-

eration by ABN AMRO and others. To provide all the information required by investors, a water footprint assessment has to be conducted. In conclusion, investor demands for information are an indirect factor, which can motivate businesses to apply PWFL.

4.6 Pressure from Government and Demand from NGOs

The impact of water scarcity and water pollution will be felt more and more as governments increase the use of the three policy levers of tax, public expenditure, and regulation in order to penalize, incentivize, or instruct behavior change from businesses (cf. Grobbel et al., 2010; Wales et al., 2010). In most cases, if there are problems in a water-scarce region and people are unsure who to blame, businesses are assumed to be at fault and the government is likely to respond by strengthening regulations and forcing businesses to change their operations. These social and political reactions can lead to alterations in water allocation, caps on water use, increased water acquisition and treatment costs, reduced water supply, the setting of new permit standards, more stringent wastewater treatment requirements, riskier infrastructure planning, and capital investment and potential reputation damage. In rare cases, businesses may be shut down by local governments or may voluntarily shut down because they are no longer viable (cf. Ceres, 2010; The Coca-Cola Company, 2010).

Since most businesses thrive in a stable regulatory regime, an unpredictable change can be a serious problem. Regulatory risks to businesses arise when a change in law or regulation raises the cost of operating, reduces the attractiveness of investment, or changes the competitive landscape (cf. Orr et al., 2009). Companies operating in the EU are facing built-up pressure to reduce water pollution in response to the EU's Water Framework Directive.[44] Enacted in 2000, the Directive takes an integrated-water-basin-based approach and commits EU member states to achieving high water quality conditions for all water bodies by 2015. There is also evidence that Chinese authorities are progressively willing to enforce water regulations as a consequence of an explosion at a petrochemical plant in November 2005, which released 100 tons of benzene into the Songhua River and left nearly four million people without water for four days. This catastrophe triggered a revision of China's Water Pollution Control Law. The new act, announced in February 2008, raised penalties, eliminated some loopholes, and introduced environmental regulation as a measure of local government performance. With reference to environmental-related cases in Thailand, such as the recent fire at the chemical factory which gained a lot of public attention, the Thailand government announced on April 24, 2011 that the court of justice will officially open an environmental department in the next month to support victims and relatives in suing factories or governmental organizations who cause negative impact on the environment and society. [14] This action could be a beginning for regulatory actions by the Thailand government concerning environmental issues, which is undoubtedly expected to intensify in the future due to increas-

[44] The Water Framework Directive is a European Union directive, which commits European Union member states to achieve good qualitative and quantitative status of all water bodies (including marine waters up to a kilometer from shore) by 2015. It is a framework in the sense that it prescribes steps to reach the common goal rather than adopting the more traditional limit value approach.

ing environmental constraints. Currently, the ISO considers potential standards on water footprint in order to provide internationally harmonized metrics, which is expected to enhance existing standards on LCA as well as ongoing work on carbon footprint metrics. [15]

A diverse range of events can cause NGOs and other watchdogs to orchestrate negative campaigns against corporation. For example, during the late 1980s consumers became aware that the harvest of yellow-fin tuna in the Eastern Tropical Pacific caused the incidental mortality of dolphins (cf. Teisl, 2007; Weissmann, 1999). Media attention to the issue and public concern coincided with the national televising of the Sam La Budde (Earth Island Institute) video, which showed dolphins dying as a result of fishing operation in the Eastern Tropical Pacific. This initiated significant controversy and eventually there was a call for a consumer boycott of canned tuna (Teisl, 2007). As this case indicates, companies must track not only the requirements of governments, but also the demands of an incredible diversity of NGOs and other self-appointed watchdogs such as bloggers. These new players can quickly cause great damage to a company's reputation (Esty & Winston, 2006). Due to a long roll call of documented cases of environmental damage and social injustice linked to industry, businesses have historically been the bête noire of green and community pressure groups. With NGOs successfully highlighting examples of corporate malpractice, the image of businesses abusing the planet in the name of profit has gained credence in recent decades (Wales et al., 2010).

Aggressive activist campaigns, such as consumer campaigns calling for boycotts against business misconduct, are growing rapidly in many countries. Moreover, the failure of governments around the world to provide water services to local communities may exacerbate scrutiny by local and international advocacy organizations towards companies with access to secure water supplies. This issue could potentially have an impact on a company's "license to operate" in water scarce regions (cf. Ceres, 2010). For instance, beverage companies in many regions of the world such as North America and the EU must meet wastewater discharge standards. In China, the Beijing Development and Reform Commission put 12 international and local brewers, beverage producers, and dairy companies on its "List of Major Water-Polluting Enterprises" in August 2009. The Commission announced that the beverage producers on the list would be subject to increased supervision and asked them to submit plans to reduce wastewater discharge and energy use (cf. Ceres, 2010). Unlike China, the Thailand government does not currently require businesses to be greener or more eco-friendly in their use of water resources. Even if the government were to raise water prices in the future, the impact would not be significant for big businesses such as CPF because even the increased cost of water would still be relatively low. On the other hand, if Thailand's public felt that it faced a water scarcity and perceived that CPF used too much water, it would respond differently.

Even when water resources are damaged by the cumulative impact of multiple users, the government's perception that a company is to blame, whether that perception is valid or not,

may affect the company's social license to operate. In such cases, PWFL can help a company accurately express the true source of water problems to local water users as well as to the government. The label provides information about blue and grey water use by the company, which describes how much water is consumed and extracted from the local watershed, as well as how much wastewater is actually released from company's operation. The information provided by labeling can help governments hone in on the true causes of water problems in their regions, and thus permit them to respond more effectively. Dr. Aldaya explains that conducting water footprint accounting can help a company anticipate regulatory control by governments. Currently, government responses are unclear, but obviously regulations in some sectors of business can be foreseen.

4.7 Reputation and Financial Risk

For all these previous mentioned reasons, reputation damage and financial risks can emerge quickly and easily, yet cost businesses much time and money to mitigate and resolve. Reputation is one of the most important corporate assets and also one of the most difficult to protect. Owing to constraints on water resources and the manner in which companies exploit natural resources, the public continues to scrutinize a company's operation, which can easily translate into public outrage. As a result, companies face amplified risks, especially when they are judged to be extravagant or irresponsible. When a company uses water from a catchment that is in danger of drought or ecological collapse, this kind of risk becomes more extraordinary (Orr et al., 2009). Declines in water availability and quality can intensify competition for clean water, which can aggravate tensions between businesses and local communities. This is particularly true in developing countries, where local populations often lack access to safe and reliable potable water (cf. Ceres, 2010; Grobbel et al., 2010). For example, public perceptions about the amount of water used by TCCC in some countries and about the impact of the Spanish strawberry industry on that country's hydrology, have taken on the dimensions of public campaigns. Though these are local incidents, their impact is not limited to the municipal scale. Local public campaigns can translate into serious global brand damage as a result of press attention. This is magnified by the speed of the Internet, since it enables rapid worldwide communication between disparate groups (cf. Busse, 2006; Orr et al., 2009; Wales et al., 2010). Nestlé recently fell victim to such a campaign. After years of organized and well-publicized opposition by local residents and advocacy groups regarding the environmental impact of a proposed water bottling plant, Nestlé Waters announced in September 2009 that it had decided to scrap plans entirely to bottle spring water in McCloud, California (cf. Ceres, 2010).

It is almost a motto now that global businesses need to have a clear and trusted reputation, not only for marketing purposes but also to develop the public's trust that the company is providing a good and valued thing for society. If a company wants to grow in its operations globally, then it needs to be trusted by governments, business partners, investors, and other stakeholders (cf. Wales et al., 2010).

For businesses, requiring eco-labels is part of safeguarding brand and reputation (Nordic Council of Ministers, 2008). Especially in larger companies, eco-labels may have a number of intangible benefits, including building brand equity and protecting a company's license to operate (UNEP, 2005). Dr. Aldaya also states that some businesses see a corporate water footprint strategy as an instrument to reinforce the corporate image or to strengthen the brand name. The rapid spread of the concept of CSR could be seen as a logical extension of eco-labeling in order to demonstrate their responsibility to society from a reputational risk management perspective. From this point of view, PWFL as an environmental communication tool can stimulate a process of environmental awareness in companies and the general public (cf. Scherhorn, 2002; UNEP, 2005). The CPF representative also confirms that its carbon label project aimed to create brand image in the direction of environmental friendliness, and it will do the same thing with water footprinting in order to promote their image as a water-friendly company. It will conduct water footprint accounting and release PWFL products to the market. Although CPF is in accordance with ISO 14001, end consumers are unaware of this or perhaps do not understand how it relates to environmental concerns. So, the carbon label project creates slight awareness in some groups of stakeholders, such as researchers. In the end, CPF gains an environmental activist image and perception as a carbon expert. As a result, Mrs. Kimsri gets many requests to provide other companies, universities, or governmental organizations with a presentation regarding CPF's carbon footprint assessment.

Water shortages translate into higher energy prices, higher insurance and credit costs, and lower investor confidence, all of which sabotage business profitability. More common than the risk of not having enough water, is the risk that businesses find their comparative or competitive advantage threatened by cost inflation driven by water scarcity. As water, which has been cheap historically, becomes more and more scarce, it will become more expensive, significantly more in some cases. Water tariffs and other pricing mechanisms tend to increase, due to greater competition for water between sectors, higher water search costs, the need to drill deeper boreholes, higher pumping costs, and the need to recover the cost of expensive water transport schemes (Orr et al., 2009). However, according to an interview with CPF, water scarcity is still an ambiguous issue for Thailand. Furthermore, water is still inexpensive for big businesses like CPF.[45] As a result, the financial risk regarding water resources has never been considered and integrated into the company's risk assessment. Mrs. Kimsri assumes that businesses will begin to consider water issues only if communities show concern.

[45] Water price in Thailand is already mentioned in Section 3.

4.8 Economic Benefits

4.8.1 Long-run Cost-effectiveness and Price Premium

The water footprint can be an effective tool for water management because calculating a product's water footprint might help companies to identify and prioritize significant opportunities to reduce water consumption and wastewater within their own operations and throughout the supply chain. This in turn might reduce water consumption and increase operational efficiency, leading to cost savings for companies (cf. Olofsdotter, 2008). Mrs. Kimsri confirms that carbon footprint assessment helps CPF to identify the hot spots in production processes, indicating where it is best to reduce its carbon footprint. This allows the company to reduce future production costs, which leads to a reasonable price for eco-friendly products. While eco-labeling is still quite new in Thailand, the country does have experience with organic agriculture. Research conducted on rice production in Thailand came up with three factors that determine overall profitability of organic rice-growing: yield, price, and variable costs. Due to the fact that no premiums were paid, lower yield and higher variable costs resulted in organic farming that became relatively unprofitable and offered lower gross margins than conventional rice farming. Fortunately, demand for organic rice far surpasses supply, resulting in a fairly predictable and consistent price premium. According to a report on organic products by the International Trade Centre (ITC), the price premium generally ranges from 20-40% above conventional prices. Market forces seem able to promote the spread of organic farming and labeling (cf. UNEP, 2005). PWFL is expected to offer an opportunity for innovative businesses to benefit from the application of water-saving production methods by enabling access to premium eco-markets or maintaining market shares, as well as adding value to existing products through product differentiation. In addition, the prices of exported eco-labeled products of Thailand are relatively stable compared to their equivalent conventional product prices. This has been possible primarily because prices are negotiated to ensure a certain premium for organic production (Carambas, 2005).

4.8.2 Competitive Advantage

Frontrunners, who seek opportunity by creating product transparency before others do, can gain a competitive advantage through product water footprint labeling. With special focus on critical water scarcity and pollution, they can set their water footprint reduction goal and demonstrate their improvement through the PWFL (cf. Hoekstra et al., 2009). The future for competitive advantage lies in two places. First, in terms of environmental impact, competitive advantage will be found in the control of scarce resources such as water through soundly managed supply chains. Businesses, which move first to secure the water resources they need, whilst ensuring that they are operating in a transparent, trusted, environmentally sound and socially responsible way, will win and enjoy their competitive gain. These businesses will be able to best control the costs of scarce resources, ensure that their supply chains have lesser environmental impact on water resources, and inflict less negative impact on society due to their water consumption and pollution. Therefore, they can offer consumers the most sustainable choice. Second, an opportunity for differentiation emerges through directly en-

gaging consumers with sustainability issues. This can include guidance or tools for consumers on how they can improve their own water footprint, such as instruments to monitor their own impact in their homes, or the water footprint calculator provided by the WFN. It can also include enabling consumers to interact with distant suppliers of their products, ensuring firsthand that the products they buy are meeting the standards for environmental impact and ethics that they would expect. The Internet allows incredible interactivity between consumers and their ultimate suppliers (Wales et al., 2010; Nilsson, 2003). Due to word-of-mouth recommendations, businesses voluntarily join the carbon label project in order to increase their competitive potential in the market as well as to avoid competitive disadvantages, which are likely to occur if their competitors join before them.

Moving from unsustainable practices to sustainable ones preserves production and jobs in the long run, because it makes purchasing safer for the corporate buyer (Nordic Council of Ministers, 2008). The statistical significance of the label coefficient in the tuna share equation indicates that the dolphin-safe label did increase the market share of canned tuna and this increase continued over time (Teisl, 2007). An almost ideal demand system was applied in order to estimate the effect of critical media attention and dolphin-safe labeling on the market share of tuna as opposed to other seafood and meat in the U.S. food market. It identified a significant negative effect on tuna consumption caused by media reporting and suggested that at least some consumption is motivated by environmental concerns. It also reported a significant and positive effect of labeling, in the form of a 1% increase in estimated market share over and above the estimate in the absence of the label (cf. Teisl et al., 2002). Carambas (2005) also believes that eco-labeling may be used to improve market share and competitiveness of a trade product. Particularly for developing countries, it may also be used to promote exports and improve working conditions at the production sites.

To conclude, eco-labeling is adopted by most businesses as part of a competitive strategy in differentiating themselves from competitors in the eyes of consumers, government agencies, investors, employees, and others.

4.8.3 Market Access

Companies that promote eco-labeling in one prominent product line, such as Unilever, which has been a strong supporter of the MSC, obtain carry-over benefits in other product lines as well (UNEP, 2005). Nevertheless, a price premium is not the only economic benefit available to companies that adopt eco-labeling. They also tend to benefit from longer-term supply contracts. Particularly in the commodity sectors such as coffee, a long-term supply contract can greatly improve the lot of the producer. Unilever promotes this concept in its promise to the MSC that it will not commit to pay any price premium, but instead will give preference to suppliers of MSC-certified fish products. This is also the concept behind the FSC Buyers Group. FSC certification helps a timber products company gain access to a ‘members only’ procurement club. A recent report of FAO indicates that the primary reason for seeking sustainable forest management standard certification is market access, while the least important is

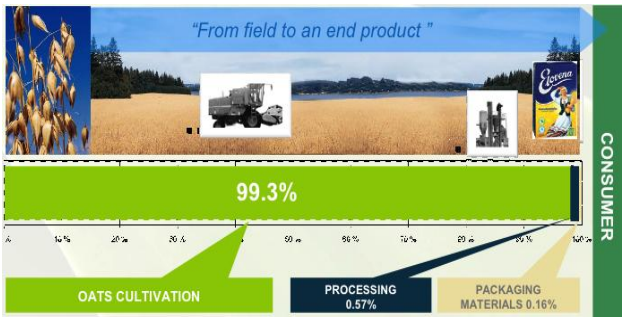
price premium. Moreover, the governments of many EU countries and the European Parliament serve only fair trade coffee (cf. UNEP, 2005).

4.8.4 Better Decision Making

Water footprint accounting might help companies to make better-informed decisions in product manufacturing, purchasing, distribution, and product development, by considering costs and liabilities that exist whenever water is over consumed and wastewater is generated (cf. Olofsdotter, 2008). It can be helpful in supporting corporate water stewardship efforts by providing a tool to measure and understand water use throughout the supply chain, which offers valuable insight into the largest components and locations of water consumption. In this way, an increased understanding of a business' water-related risks and vulnerabilities is promoted. Three kinds of water footprint: green, blue, and grey, allow companies to see their sources of water use and to quantify them separately. This leads to better decision making on defining potential opportunities to address poor wastewater treatment and associated water quality problems (cf. The Coca-Cola Company, 2010).

In short, the water footprint is a helpful tool to begin to identify potential water-related issues and risks in order to make better decisions.

According to water footprint studies by the World Business Council for Sustainable Development: WBCSD (Montreux 2010), 30 representatives from the industrial sector participated in a pilot project and most of them operated in the food and beverage sector. They stated that their motivation for using water footprinting was mainly to improve decision-making in their companies. The following paragraph exemplifies how water footprint accounting can contribute to better decision making in businesses.



	Indirect WF				Direct WF			
	Green	Grey	Blue	Total	Green	Grey	Blue	Total
WF' (m^3/ton)	302	62	0.006	365	0	0	0.923	0.923
Total WF (m^3/yr)	1,422,378	294,114	26	1,716,518	-	-	4,344	4,344
Locations	Farm and storage locations				Factory site			

Figure 4.1: *left* Water footprint of Elovena Oat Flakes, Sweden [16]
right Water footprint of Bitesize Shredded Wheat, UK (source: Chapagain & Orr, 2010)

As mentioned earlier in Figure 4.1, Raisio of Finland was the first company to launch an H_2O label of its product. The H_2O label indicates that 100 grams of Elovena Oat Flakes consume 101 liters of water along the supply chain, which can be divided into three categories: 99.3% from crop cultivation, 0.57% from manufacturing, and 0.16% from packaging materials. Figure 4.1 also displays the water footprint accounting of various companies. It shows that most of the product water footprint consisted of rainfall and evaporation, which occurred in the

crop cultivation phase. To the contrary, product water footprints of the processing and packaging phases are absolutely insignificant. Water footprints of Bitesize Shredded Wheat show that its indirect water footprints overwhelm its direct water footprints, which are created by the operation at the factory level and storage. The direct water footprint's source is blue water, whereas the indirect water footprints consist of green and grey water from the activities of crop production. To conclude, over 90% of water use relates to the cultivation of raw crops.

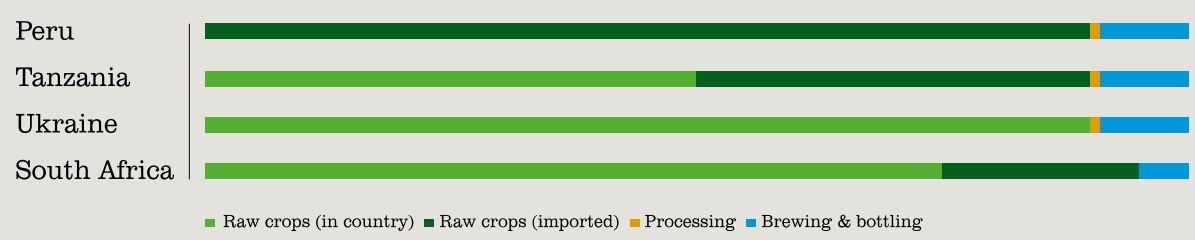


Figure 4.2: Comparison of water use (percent) of SABMiller beer, various countries (source: SABMiller et al., 2010)

However, there was some variation between countries in terms of how much of this water related to crops grown in the country and how much was attributable to imported produce, as can be seen in Figure 4.2. In Peru, the bulk of the water footprint related to imported crops, whereas in the Ukraine, all the water used was attributable to crops grown there. SABMiller can use this information as an opportunity to consider water-related risks associated with strategic global procurement of agricultural commodities.

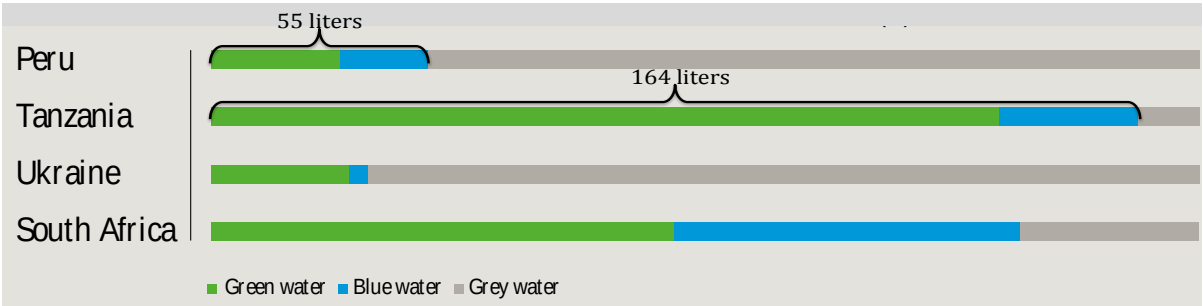


Figure 4.3: Total water footprint of SABMiller beer (percent), various countries (source: SABMiller et al., 2010)

Results from water footprint accounting in Figure 4.3 also show that the net crop cultivation water footprint including crops grown in-country and imports varies from 164 liters of water use in Tanzania to 55 liters of water use in Peru, despite almost all the crops used in beer production in Peru being imported (see also Figure 4.2). These differences are due to variations in crop water requirements caused by the different climatic conditions. Crops produced in Tanzania and the Ukraine are predominately rain-fed because they depend on green water more than blue water, which means producers rely on rainfall more than surface water or irrigation systems. There is a considerable gap in the generation of grey water between the Ukraine and Tanzania, particularly because of different fertilizer use and standards (SABMiller et al., 2010). Again SABMiller can use this information to improve its know-how and technology transfer among its suppliers from different continents. Finally, SABMiller can use this

information to plan and set annual targets of possible grey water reduction for the Ukraine and Peru as well as to prepare emergency plans for Tanzania in case of rain shortage, since Tanzania's crop productivity relies substantially on green water.

4.8.5 Water Supply Security

The PWFL will provide compelling support for the need to engage more directly with suppliers, governments, and other stakeholders on responsible water stewardship (cf. The Coca-Cola Company, 2010). Despite tight management and controls of businesses, the greatest water-related risks are often associated with producers at the beginning of the supply chain. While impact is not readily apparent, factors including water stress, competing and increasing pressures for water resources, and climate change, may affect supply. Engagement with other stakeholders through the PWFL ensures that shared water resources are managed sustainably (cf. The Coca-Cola Company, 2010). Water footprint accounting can improve internal understanding of water use. Pilot studies demonstrate that focusing on operational water use is important, but it is not enough. Freshwater use throughout the supply chain needs to be addressed as well. The results derived from water footprint accounting can be used to help direct a company's efforts to encourage improved water stewardship in the supply chain. For example, a sugar beet pilot study indicated that some sugar processing plants have large grey water footprints due to low levels of treatment (cf. The Coca-Cola Company, 2010). As a result, a potential area for future engagement with suppliers is highlighted, which in turn helps companies to secure the water resources they depend upon. According to Figure 4.3, Peru and the Ukraine, it is obvious that grey water overwhelms total water footprints, which would not have been known if water footprint accounting had not been conducted. This insight suggests that agricultural practices within a region have a potentially far greater impact than previously thought, particularly in relation to the degradation of existing high quality water supplies (SABMiller et al., 2010).

4.9 Corporate Social Responsibility

The focus on environmental and social requirements began with the physical characteristics of a single product or product line, such as Blue Angel, followed by the management of a whole production facility such as the FSC and MSC, Max Havelaar,[46] and the International Federation of Organic Agriculture Movements (IFOAM).[47] Recently, corporate codes of conduct and policy statements focus on the overall activities and impact of entire companies such as the Global Compact. Companies' complete corporate policies regarding environment and social responsibility must be considered, which is accelerated by progressive attention to supply chain responsibility (UNEP, 2005). Adoption of an eco-label by companies such as FSC, and co-branding of their products contributes to companies' benefit derived from positive associations related to FSC and its supporters. Survey results confirm that companies join the program more to participate in a multi-stakeholder forum than for the environmental effectiveness of the standard. An informal survey of senior executives responsible for sustainable development policy at 20 major European companies indicated that the major drivers for their voluntary actions for sustainability were employee concerns, access to capital, reputational risk management, and protecting their license to operate (UNEP, 2005). Surveys of recent university graduates regularly cite the perception of the social responsibility of a company as a major reason for choosing a particular business to work for and this remains an important issue once people get into their careers (Esty & Winston, 2006).

As mentioned earlier, consumers are increasingly focused on a complex range of environmental and social issues, including water issues. While they understand that responsibility requires a sound balance between these, they might not have the time or ability to intricately balance all concerns. The PWFL can be used to communicate a company's CSR strategy with regard to water management to the public. Market actors are also increasingly prepared to reward companies that provide this evidence (cf. UNEP, 2005).

Addressing the issues of freshwater scarcity and pollution should be seen as part of CSR because freshwater scarcity is generally mentioned as the next big environmental challenge after global warming (Hoekstra et al., 2011). Moreover, water is also a basic right for living. Due to the expansion of agricultural and industrial production and a lack of adequate wastewater treatment, access to safe potable water for almost 900 million people worldwide is restricted and five million people die each year due to water-related illness (Ceres, 2010). Therefore, businesses in the food and beverage sector should be attuned to the ecological impact of their operations along the supply chain and, as an ethical consequence, it is reasonable that they take responsibility for that impact by improving their production processes. The ecological impact induced by the food and beverage industry in Switzerland including the supply chain was investigated and Figure 4.4 summarizes the results. As indicated, the

[46] The Max Havelaar Foundation awards a quality label to products that have been produced according to principles of fair trade. Fair trade contributes to improving the living and working conditions of small farmers and agricultural workers in disadvantaged regions. It is a member of the Fairtrade Labelling Organizations International (FLO) and complies with their international Fair trade standards.

[47] International Federation of Organic Agriculture Movements (IFOAM) is the worldwide umbrella organization for the organic movement, uniting more than 750 member organizations in 116 countries.

food and beverage sector causes ecological impact in various dimensions, especially water (Belz, 1995).

Supply chain **Environmental dimension**	Agriculture	Food and Beverage Industry	Food Trade	Consumers
Energy				
Air				
Water				
Land				
Waste				
Ecosystem				
Health				

white: low environmental impact – grey: middle environmental impact – black: high environmental impact
Figure 4.4: The ecological impact matrix (source: Belz, 1995)

To begin with the agriculture step, both ground water and surface water are polluted by substances in fertilizer used by farmers, especially nitrate. Its excess concentrations cause degradation of water quality (Belz, 1995). Wastewater is the central problem of the food and beverage industry step. In accordance with the Frauenhofer-Institut's study of the emissions of the food and beverage sector, it is clear that the whole chain of the food and beverage industry, which includes malt houses, breweries, dairies, vegetable fats and oils industry, viticulture, fruit and vegetable processors, and fish processors, releases wastewater contaminated with phosphate in the highest level when compared with other environmental impact such as air pollution or soil degradation (Belz, 1995). A water-friendly improvement in or adaptation of the sector's operations in the first two steps of the supply chain will lead to a reduction of the negative impact to the environment and society respectively (cf. Villiger et al., 2000). Dr. Aldaya adds that environmental awareness and strategy are often part of business CSR. Reducing the water footprint can be part of the environmental strategy of a business, just like reducing the carbon footprint. A company's commitment to reduce water use in production processes as well as wastewater demonstrates sustainable leadership and a proactive CSR. PWFL can be considered part of such a commitment, which can in turn improve a company's position with customers, employees, investors, and business partners by enhancing the brand's reputation and differentiating the company on the market. Although CPF does not consider water in its risk assessment, it is aware of the ecological impact on water resources generated by its operation along the supply chain. Wastewater is treated before being released into the environment. Recycled water is also used in gardening, though not in the company's production processes. Also, eutrophication issues are a concern. For example, the company's shrimp farms are closed-loop systems. Water is treated before use in the shrimp farming process and wastewater is properly handled and reused in the farming process. Dr. Lohsomboon explains that businesses who conduct carbon footprinting can also send information derived from carbon labeling to their suppliers. This could be applied with water footprinting as well. They might consider it a kind of value added which shows that companies have CSR.

4.10 Opportunity for Innovation

Companies in the most environmentally intensive industries that fail to anticipate and adapt to the environmental limits most relevant for their industry are likely to struggle. By the same token, resource scarcity will drive major technological innovation by academic researchers, entrepreneurs, and businesses (Wales et al., 2010). A decade ago, addressing social and environmental challenges was frequently viewed by businesses as solely an exercise in risk management and was carried out by providing the right risk mitigation strategies. Now, an increasing number of businesses realize that these global challenges are not just risks to be mitigated, but also opportunities to drive innovation (cf. Petersen, 2008; Wales et al., 2010). One of the most important contributions business can make is to create innovative products and services which deliver the same or a better quality of life for consumers with lower environmental and social impact (cf. Müller & Schaltegger, 2008; Wales et al., 2010).

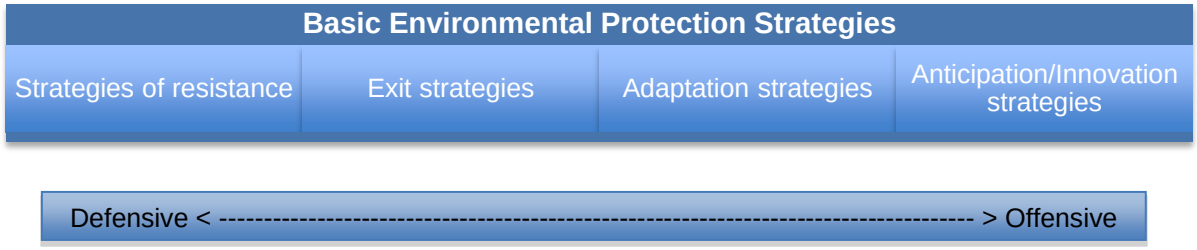


Figure 4.5: Basic environmental protection strategies (source: Meffert & Kirchgeorg, 1998)

According to Meffert and Kirchgeorg (1998), basic environmental protection strategies can be categorized into four points of view (see Figure 4.5): strategies of resistance, exit strategies, adaptation strategies, and anticipation/innovation strategies. The first two strategies are classified as defensive, but on the contrary the last two strategies are designated to be offensive. In the PWFL case, the latter strategies are strongly recommended. The anticipation strategy is specifically suited for gaining competitive advantages because companies have to tackle environmental problems with innovation from an integrated perspective. Environmental-oriented innovations of adaptation strategies concentrate rather on end-of pipe-oriented problem solving, whereas anticipation strategies distinguish themselves by using strategic arena in order to develop systematic and integrated environmental protection innovations. These strategies involve concerted practices in various company functions derived from differentiated ecology-oriented information bases. As a result, competitors cannot rapidly copy innovations stemming from anticipation strategies.

The voluntary agreement by many businesses to be certified by a carbon label represents an innovative opportunity, at least in Thailand. Currently, global warming and greenhouse gas are gaining attention from various businesses in Thailand, explains Dr. Lohsomboon. The carbon label is one option for them to show their customers that they are concerned about more than their profit, and the label is predicted to be more and more popular, at least in the next two years. 176 products from 50 companies, most of them in the food and beverage sector, are already certified by TGO and have a carbon label attached to them. Certified

products include, among others, rice, chicken meat from CPF, animal food, and packaging for snacks and beverages. A survey about business motivation found that innovative opportunity is one of the main factors for the adoption of the carbon label. Businesses who understand that the benefits of labeling will exert influence over other companies through their leadership of industry bodies, ensuring that their suppliers act progressively, and changing society's expectations about the meaning of being responsible. The pace at which the rest of the businesses around the world follow the lead set by the group of leading companies will be critical in shaping the collective response to shared sustainability challenges (Wales et al., 2010).

Without a demand or request from the market, companies still believe that calculating a carbon footprint is a kind of competitive opportunity. This is demonstrated by CPF, which continues its labeling project solely to be a leader of the market. It does not expect any profit from carbon-labeled products, since they are sold at the same price as other products. Likewise, the challenge of global freshwater scarcity can actually turn into opportunity for those companies that act proactively before others do. Product transparency through the PWFL can turn these challenges into competitive advantages, especially in areas where water scarcity and pollution are most critical (cf. Hoekstra et al., 2011). CPF also affirms that opportunity for innovation would be its main motivation if it conducted water footprint accounting and launched PWFL products. In order to be a leader, it has to search for an innovation and do it before others.

4.11 Summary

Climate change, forest canopy, El Nino, and the intrusion of seawater worsen the scarcity of surface and ground water and reduce rainfall in both quantity and frequency. Geological features of some areas, especially in developing countries, drive migration to urban and big cities. Population growth and wealthier standards of living contribute to pressure on water resources. Price incentives encourage farmers to cultivate water-intensive crops in water-stressed areas. Agriculture's use of pesticide and fertilizer and industry's releasing of untreated wastewater to waterways causes contaminated water problems in most regions. Both water shortage and pollution stimulate governments to increase the price of water, strengthen wastewater treatment regulation, and change the cap on water use. These actions lead to an increase in cost and lost revenue. At the same time, they prompt the anxieties of investors, banks, and shareholders about business performance.

Water shortages and pollution directly wake the interest of consumers and NGOs, which can lead to reputation risks, as information is spread rapidly by the press, media, and especially the Internet. Retailers are encouraged by the demand for more information by consumers and NGOs as well as by the price premium of PWFL products. Loss in production, growing cost, and deprivation of revenue are caused directly by water shortage and pollution, and as a consequence, financial risks of businesses arise. Limited access to water can raises ethical and human rights issues in society and these spark attention from the government and public, which in the worst case, can translate into erosion of the business license to operate. Consumers, NGOs, the press and media, investors, shareholders, and retailers are directly requesting product transparency and disclosure of operations, whereas governments are indirectly demanding them.

Businesses are able to respond by using either defensive or offensive strategies. If businesses believe that these challenges present innovative opportunities, they will choose offensive strategies, either adaptation or anticipation, and improve the water friendliness of their production processes in order to deliver possible and expected positive sustainable effects to the environment and society, as mentioned in Section 2. They will launch the PWFL in order to communicate their performance directly to retailers, NGOs, and consumers, and indirectly to investors, bankers, shareholders, and the government.

5. ROLES OF STAKEHOLDERS

The setting of product water footprint labeling standards, like other labeling standards, involves struggle, negotiation, and communication among a broad group of organized actors (cf. Boström & Klintman, 2008). There are at least three important areas that require priority support: water-saving conversion, certification service, and consumer education and public promotion (cf. Carambas, 2005). Organic agriculture and eco-labeling can provide readers with a clear picture of the current situation with regard to eco-consumption in Thailand. Organic agriculture and eco-labeling are still in the developmental stage in Thailand compared to the state of these practices in industrialized countries. There is much to be improved regarding the availability and quality of support services. Support certainly depends on whether the country's government perceives eco-labeling as a beneficial policy measure. The production of commodities under eco-friendly processes and the labeling of these products are primarily undertaken to satisfy the demands of developed countries. In the domestic market, the demand for eco-labeling is still low due to a lack of public awareness, as a result organic production appears less important than it really is (cf. Carambas, 2005).

According to the interviewee from TGO, the carbon-footprint-labeling program in Thailand was initiated through cooperation between MTEC and TGO, and they take full responsibility for the whole project. In addition to TGO and MTEC, researchers from many universities were invited to join the project as LCA technical experts who worked together with all pilot factories. The working group also gained necessary information, such as emission factors, from the National Life-Cycle-Inventory (LCI) database gathered by MTEC. Other support organizations provided training courses and conducted seminars for pilot factories because they believe that Thai industries will benefit from this project in the future. The most important factor for the success story of carbon footprint labeling is the industrial sector's strong interest in the project. However, product water footprint labeling has to begin from the zero point; therefore, more effort is necessary.

Owing to limitations such as lack of water footprint know-how, inadequate awareness of water scarcity, and financial constraints, not every farmer, business, or NGO could join this labeling scheme, at least during the first stage. This section will demonstrate the role of stakeholders who have the ability to join and play a role in product water footprint labeling. These stakeholders consist of farmers, exporting businesses, international retailers, international non-governmental organizations (NGO), governments of developing countries, and worldwide consumers.

5.1 Farmers

Producers make the goods that are to be labeled or supply certified raw material to businesses and retailers, so that they can label products. It is a common pattern that actors at the beginning of the production chain are less enthusiastic about labeling or certifying their goods than actors in the middle of the chain or big retailers or businesses who require their suppliers to obtain certification labels. The main reason that producers are less eager to adopt standards is that they have to bear most of the costs due to the standard criteria. It is producers, rather than retailers, who have to make on-the-ground changes and who must be audited by a third party because standards in labeling generally focus more on production and less on distribution and transportation. Moreover, actors at the beginning of the production chain are further removed from end consumers and might not experience consumer pressure or public scrutiny. Nevertheless, big producers, like big retailers, can be highly visible, which makes them a good target for protests by environmental and social movement campaigns (cf. Boström & Klintman, 2008; Busse, 2006). Producers can be classified into two groups with respect to their financial dimensions: farmers, who represent small producers, and businesses, which represent large producers. This will be explained further in Section 5.2.

The following example of organic commodities shows that farmers are essentially the key players in the labeling process. In Thailand, the farmers of eco-labeled commodities are either individuals or organized farmer groups. The majority, however, are of the latter type. Organizing into groups enables farmers to share information about farming techniques and the cost of certification. It also lowers the cost of certification because per farm inspection costs are lower under collective certification than under individualized certification. Under a supply agreement with businesses, farmers can produce organic crops and exclusively sell all products to businesses at pre-agreed prices. Besides organic certification, businesses typically provide extension support as well, such as technical training and input credits for contracted farms (cf. Carambas, 2005). Farmers also gain benefits from collecting water footprint data that result from a general transparency of input factors. Knowing how much water, fertilizer, and pesticides are spent per ton of output could help farmers to monitor and reduce their expenditures and increase their transparency for their buyers including wholesalers, exporters, and end customers. As a result, the necessary effort for calculating a water footprint could be part of a “bigger picture” of physical accounting and can help farmers when they are asked for related figures, e.g. for carbon footprint, which is explained further in Sections 5.2 and 5.4.

Mrs. Kimsri discusses whether product water footprint labeling can influence farmers to respond to water scarcity challenges and even compel them to change their methods of production. In the food production chain, water is more important for farmers than for end consumers. If water were scarce in some regions, it would not be necessary to wait for market forces, because farmers themselves would react to the situation before end consumers ex-

erted pressure. However, if the PWFL worked, then end consumers would have a chance to support water-saving farmers through purchasing products that have lower water footprints.

For livestock farmers, a major concern is the water footprint of the feed they buy or produce. For crop farmers, various options to reduce crop water footprints are available. Options for reducing green water footprint include increasing land productivity (yield, ton/ha) in rain-fed agriculture by improving agricultural practices and mulching the soil. Since the rain on the field remains the same, water productivity (ton/m^3) will increase, thereby reducing the green water footprint (m^3/ton). Covering the soil with materials such as decaying leaves, bark, or compost spread will decrease evaporation from the soil surface. In irrigated agriculture, changing irrigation techniques and application philosophies can greatly reduce the blue water footprint. For example, using drip irrigation instead of sprinkler or furrow irrigation can substantially reduce evaporation. Furthermore, the conventional farmer strategy of optimizing yields (ton/ha) often leads to unnecessary use of irrigation water. Instead of applying full irrigation, it may be wiser to choose "deficit irrigation," an irrigation philosophy that aims to obtain maximum water productivity per crop (ton/m^3) rather than maximum yields (ton/ha). In deficit irrigation, water is applied only during the drought-sensitive growth stages of a crop. Except for these periods, irrigation is limited or even unnecessary if rainfall provides a minimum supply of water. Farmers can also choose another crop or crop variety that better fits the regional climate, and thus requires less irrigation. Another alternative is "supplementary irrigation," which saves even more water. This strategy aims to improve and stabilize yields by adding small amounts of water to essentially rain-fed crops during times when rainfall fails to provide sufficient moisture for normal plant growth. Developing the irrigation schedule by optimizing timing and volumes of application or diminishing evaporation losses from water storage in reservoirs and from the water distribution system are interesting possibilities as well. The grey water footprint can be reduced significantly by adopting an organic farming principle, which excludes or strictly limits the use of manufactured fertilizers, pesticides, and other chemicals. Applying fertilizers or compost in a form that allows easy uptake or optimizing the timing technique of adding chemicals, so that leaching and run-off are reduced, are other alternatives (cf. Hoekstra et al., 2011).

There is a type of rice cultivation in China, India, Indonesia, and Madagascar called "water-less rice." Basically, rice is being produced under flooded conditions, i.e. in fields with a water layer of 5-15 cm. Rice plants do not strictly need flooded conditions for their growth. The reasons for flooding are primarily of agronomic nature, meaning that they facilitate field operations. Flooding makes land preparation of heavy soils easier and suppresses weeds and diseases. Water carrying nutrients and ferns, such as Azolla, flourishing in the water layer provide the rice crop with nitrogen. Improved insight into rice production and the availability of new technologies make all these arguments less valid than they used to be. Judicious use of agrochemicals, mechanization, and proper water management cancel out most of the reasons for growing rice under flooded conditions. While no crop can grow without water, the term water-less refers to the necessity of evading the need for a visible water layer in rice fields. Field experiments are carried out to minimize water use in rice cultivation while main-

taining or increasing rice yields. Preliminary results indicate that water input in rice fields can be reduced by 50%, while hardly affecting rice yields. Transformation of flooded rice cultivation requires adjustment of the entire crop management. Therefore, changes to numerous practices, such as fertilizer regimes and weed and disease control should be examined simultaneously. In addition, socio-economic and institutional conditions strongly differ between locations; hence, location-specific cultivation practices need to be designed (Koopmanschap et al., 2003). After implementation of appropriate water-saving agricultural practices, farmers have to collect information about their water use and the source of their water. At this stage, exporting businesses and international NGOs must provide know-how about water footprinting and the methods for collecting necessary data.

In conclusion, the role of farmers in supporting the PWFL consists of two main tasks. First, they can try to reduce the water footprints of agricultural practices using several of the practical strategies discussed above. This must be the foremost duty of farmers. Second, farmers can contribute by collecting data regarding water consumed by cultivating crops for export at the cultivation phase. Sufficient raw data is the most critical aspect of calculating the water footprints of products, and most of this data occurs at the cultivation phase. As a consequence, farmers are responsible for collecting this data. This will be possible only if farmers gain sufficient assistance from exporting businesses and international NGOs. Participation in setting the national PWFL standards is preferable so that farmers have a chance to express their opinions on advantages and disadvantages.

5.2 Exporting Businesses and International Retailers

Large and multinational companies are more likely to have the technical capacity, management structures, and skills to implement standard requirements and to market their products. Small enterprises, which are often family-owned or community-based, have less technical and financial flexibility and may have a stronger dislike for risk because they do not have the financial power to bear the costs of risks. It is also common for large companies to enjoy superior access to information about existing and prospective certification requirements. Nevertheless, the big-versus-small split should not be exaggerated, as there is also evidence of small companies participating in labeling or even making their brand as an eco-label. Bionade[48] is an appropriate success story, demonstrating that a small, family-owned business can be the leader of the organic market. Its products are certified by organic certification of the EU and Germany, which proved that the organic market does not necessarily have to be a niche market or small. Moreover, there are sometimes disadvantages for big companies in adopting eco-labeling. For example, giant technological investment may create such passivity that it is difficult to undertake continuous revisions, which labeling programs often require (cf. Boström & Klintman, 2008).

[48] Bionade is a range of organic fermented and carbonated beverages. Bionade is manufactured in the Bavarian town Ostheim vor der Rhön in Germany by the Peter beer brewery now owned by Dieter Leipold.

As mentioned in Section 2, there are a lot of benefits to labeling, which include not only economic advantages, but also environmental and social positive effects. At the first stage of water footprinting, exporting businesses tend to have clear incentives and the ability to promote the PWFL. This is because Thai consumers have less awareness of socio-ecological issues than consumers in developed countries, and these businesses possess larger financial budgets than domestic businesses. In addition, exporting businesses are pressured and motivated by several items that were already explained in Section 4. As a result, being certified by the PWFL is more worth the effort than ever before in an increasingly water resource constrained world.

5.2.1 Understanding the Water Footprint Concept

The first endeavor of exporting businesses is to learn and understand the water footprint concept. Then they need to take a closer look at their supply chains and find the hot spots of water consumption. Mrs. Kimsri explained that water is used intensively in factories and farming. In factories, it strongly relates to food safety standards that require exact amounts of water for processing. For example, cleaning chicken before further processing the chicken meat requires a specific number of liters of water in accordance with food safety standards. In order to clarify businesses' activities regarding water footprinting, annual quantitative water footprint reduction can be undertaken. Within large companies, benchmarking is another useful tool for achieving water footprint reduction goals based on the assumption that what can be achieved in one factory should also be possible in another factory.

Businesses can reduce their operational water footprint by reducing water consumption in their own operations and bringing water pollution to zero. By avoiding any evaporation, the blue water footprint can be reduced to zero. By reducing the production of wastewater as much as possible and by treating wastewater, the grey water footprint can be reduced to zero as well. Treatment can be done within the company's own facilities or by a public wastewater treatment facility. It is the quality of the water finally discharged into the ambient water system that determines the grey water footprint (cf. Hoekstra et al., 2011). Mrs. Kimsri comments that there are still usable technologies for using and acquiring blue and green water. However, if CPF wanted to change its water recycling system, technologies from foreign countries would be required.

5.2.2 Reduction of Water Footprints along the supply chain

For most businesses, the supply chain water footprint is much larger than the operational footprint. As a result, it is crucial that businesses seek to reduce the product water footprint of the whole supply chain. However, achieving improvement in the supply chain may be more difficult because it is not under the direct control of businesses (cf. Hoekstra et al., 2011). In order to achieve water footprint reduction goals, exporting businesses can support farmers during the conversion period to water-friendly agriculture to ensure that farmers do not drop out due to low productivity and product marketability. Generally, the support involves assis-

tance to farmers in planning and managing their farms according to water-saving methods (cf. Carambas, 2005). For example, PepsiCo helps farmers in China to grow potatoes as raw material for Frito-Lay because it needs potatoes with good shape and yellowish color. The company started to grow them by educating local farmers and lending them technologies from other continents such as Australia. [17] Water-conserving pivot irrigators were installed with an initial water savings of 30% by moving from traditional flood irrigation to pivot. The company plans to shift from pivot to drip irrigation with the aim of conserving 50% of the water needed over traditional farming methods. Additional water consumption of nearly 0.25 billion liters per year for the operation will be avoided. Water conservation techniques are shared with its local farmers, leading to a 50% reduction in the amount of water required to grow potatoes for Frito-Lay. In 2009, the company's state-of-the-art water filtration and purification system that recycles and reuses water used in production, allowed Frito-Lay to consume 22% less water than the previous industry standard in its production facilities. The same technique is also applied in the U.S., resulting in the recycling and reuse of approximately 80% of the water utilized in production. In Australia, Gatorade cleans and purifies new bottles with purified air instead of rinsing them with water, and thus saves billions of liters of water. In India, local farmers are taught to adapt an agronomic practice in paddy cultivation called, "direct seeding." Rather than growing seedlings in a nursery, planting them, then flooding their fields, direct seeding allows the seed to be planted directly into the ground, bypassing the nursery. This also eliminates the need for flood irrigation, reducing water use by as much as 30%. In 2009, direct seeding was extended to 6,500 acres of paddy fields, which saved more than 5 billion liters of water (PepsiCo, 2010).

Exporting businesses can also reduce their supply chain water footprint by making supply agreements, which stipulate that a certain water footprint target must be met. A company can also reduce the consumer water footprint inherent in the use of their product by educating the public on how to consume it in the most efficient way (cf. Hoekstra et al., 2011). For example, companies can instruct consumers on how to clean rice or vegetables using less water, but still in accordance with proper food hygiene. This in turn, provides the benefit of consumer awareness of PWFL products.

5.2.3 Water-friendlier Transformation Plan

In addition to farmers, businesses may also face a conversion period in switching to water friendly practices because the whole business model may need to be transformed in order to better control supply chains and make them fully transparent to consumers regarding the PWFL. For example, Frosta, a German food producer, pursued an alternative business strategy during their eco-friendly conversion phase. Frosta offers conventional as well as organic food products to its customers. It produces low-priced frozen food for retail brands, and also high quality frozen food for the Frosta brand itself. The "Frosta Reinheitsgebot" guarantees that the frozen food is produced without artificial coloring, artificial flavors, preservatives, or stabilizers, and Frosta frozen food also fulfills social and ecological criteria through an eco-labeling scheme for seafood products by the MSC. The two product brands are produced in

different production lines and belong to different strategic business units. In a way, the Frosta case reflects the increasing polarization of the food market, with a price segment on the low end and a quality segment on the high end (cf. Belz & Pobisch, 2005).

5.2.4 Water Footprint Accounting

The next step for businesses pursuing water conservation is to collect water footprint data from farmers and operational processes and to prepare water footprint accounting of products. Mrs. Kimsri, comments that it is definitely possible, and not terribly difficult to calculate the water footprints of CPF food products, because the company already conducts material and energy flow assessment of its system, which provides basic data about water use and wastewater. Nevertheless, the company may have to analyze this data more precisely. Some respondents of the survey question about product water footprint labeling believed that PWFL could lead to dependency on foreign technologies in order to operate water-friendly production processes and calculate water footprints. As a consequence, they believe this labeling practice could bring disadvantages to Thailand. Moreover, they claimed that Thailand is a land of water, thereby making it unnecessary to focus on water issues. Mrs. Kimsri, however, disagrees with these claims because she does not believe that companies would need to buy new technology solely for the purpose of calculating a product water footprint.

Since CPF already launched carbon-labeled food products, it is reasonable to ask about the feasibility of complementing those products with the PWFL. Mrs. Kimsri replies that at this moment, the meaning of the PWFL is still not clear. However, she assumes that assessing a carbon footprint should be similar to assessing a water footprint. Additionally, she is quite sure that raw data used in calculating carbon and water footprints are derived from the same database that is collected and generated by material and energy flow assessment. As a result, CPF could analyze water footprinting of carbon-labeled products or apply water footprinting to other products. She added that it depends on the market. If carbon-labeled products were popular, CPF would add the PWFL to them and sell them as premium products that are sensitive not only to climate change and global warming, but also to water scarcity. However, if the target group of the carbon label was not interested in water issues, then it would have to launch the PWFL on another product such as pork. Similar to farmers, companies can use water footprint accounting and labelling as part of a bigger program to observe and reduce ecological and social impact, such as carbon footprinting, energy use, and improvements in labour conditions. A company that pioneers these kinds of ideas could obtain a bigger market share from socio-ecological conscious customers.

5.2.5 Public Trust

Exporting businesses can propose a PWFL after doing the preceding tasks if they do not want to launch the label on their own. Although Dr. Lohsomboon thinks that businesses should not independently issue and certify labels because consumers, basically, will not trust these kinds of labels, it is still a possibility. If a company’s strategies include being a pioneer

in the market (anticipation/innovation strategies), then launching a PWFL is an effective and feasible option. According to Nilsson (2003), there are three ways for businesses to assure consumers about the credibility of the scheme. First, they can ask “public trust agents” who specialize in environmental issues, such as the World Wide Fund for Nature (WWF),[49] for support. Second, an absolutely credible and transparent process is needed, which can be accomplished by providing as much information as possible to the consumer (signaling the company’s environmentally friendly performance). The company can invite their customers to visit its factory and see how their food is produced. Third, if consumers are to be convinced to purchase labeled products, informing them about superior quality aspects of labeled products and what is being done to maintain and guarantee the certified levels is ultimately recommended.

Back-up or cooperation from retailers, who may already have a degree of consumer trust, is another way to gain trust from consumers. It was found in cases of eco-labels owned by retailers or producer that the advantage of passing on the message of the label is also effective. These promotion methods allow consumers to test the product physically via point of sale materials or life-style promotion efforts. Aggressive marketing is a significant tool that helps consumers identify themselves with a scheme or a brand, which then leads to trustworthiness (cf. Nilsson et al., 2003). As mentioned in Section 4, retailers in Thailand are quite small in terms of financial budgets and scope of their operations. They have no influence over exporting businesses. As a result, international retailers such as Wal-Mart, Tesco, and Carrefour have to play a role in promoting a PWFL. They may also shoulder the cost of certification for exporting businesses and cooperate with them in proposing or launching a PWFL. They need to act as a bridge agent between exporting businesses and consumers and play an active role in promotion and marketing. Because big retailers operate their chains on a global scale, they have the ability to educate end consumers about the water footprint through their stores in China, the UK, the U.S., and other countries. Though pieces of this information are already available on the Internet, consumers do not seem to be aware of this source of information, and thus, would like to receive more information about the labels (cf. Nilsson et al., 2003).

5.2.6 Stakeholder Dialogues

The more social and political institutions favor water-friendly consumption, the easier it is for companies to market PWFL products beyond niches, which means companies can take their role one step further. They may engage in stakeholder dialogues and in political discourses to change the existing institutional framework, which allows and often even favors unsustainable consumption. If the institutional framework sets moral, social, and economic incentives for consumers to behave in water-concerned ways, companies supplying PWFL products will

[49] The World Wide Fund for Nature (WWF) is an international non-governmental organization working on issues regarding conservation, research and restoration of the environment. It was formerly named the World Wildlife Fund, which remains its official name in Canada and the United States. It is the world's largest independent conservation organization with over 5 million supporters worldwide, working in more than 90 countries, supporting around 1,300 conservation and environmental projects.

prosper (cf. Belz & Pobisch, 2005). Moreover, an increase in the supply of these PWFL products may increase consumer purchases simply through greater availability without changes in individual awareness (cf. Teisl, 2007). The development of product water footprint labeling depends heavily on the extent to which consumer groups learn about such schemes and become actively engaged in influencing them. Without inviting a wide range of consumer organizations that have good contact with various consumer groups, the complexity value bases that are inherent in such schemes are unlikely to stimulate reflective consumer trust. As a consequence, it is wise for businesses to create forums for education, discussion, and debates in which consumers can learn about the limits and opportunities of the PWFL (cf. Boström & Klintman, 2008). Lastly, proper and effective marketing and promotion, with the collaboration of retailers is undoubtedly necessary.

5.2.7 Summary

In summary, exporting businesses have two main roles in promoting product water footprint labeling. First, they have to learn and understand the water footprint concept, and then the need to try to reduce their water use, both in their own production and along the supply chain. Blue and grey water could be decreased through sound water management and the setting of benchmarks within factories. However, to reduce the water footprint in the supply chain, more effort and strategies are required. Providing know-how and technologies regarding water-saving approaches to farmers, and including water footprint reduction goals in supply agreements are options that should be considered to lessen water footprints in the supply chain. Second, to propose or launch a PWFL, exporting businesses might have to prepare transformation plans because the shift to water-saving production methods may change their business models. After that, businesses need to collect water footprint data, prepare water footprint accounting, and build consumer awareness and trust. Partnerships with international retailers in educating their consumers, engaging stakeholders in dialogue, and creating connections with consumer groups are strongly recommended. International retailers could help shoulder the cost of certification for exporting businesses and act as a bridge between them and consumers. Collaboration between international retailers and exporting businesses in either proposing or launching the PWFL and in formulating sound promotion and marketing plans for the PWFL is worthwhile.

5.3 International Non-Governmental Organizations (NGOs)

Non-governmental or non-profit organizations such as the WWF, that have traditionally developed philanthropic[50] relationships with businesses, are now being seen as vital partners who can help businesses understand the sourcing risks they face from failure of eco-systems in general and water resources in particular. Oxfam[51], which has historically focused on providing assistance to the poor and lobbying governments to improve international aid, is now working with businesses to help them understand how to maximize the development benefits of their activities (cf. Wales et al., 2010). Cooperating with NGOs in labeling tends to be seen as a strong reflection of consumer power. It is obvious that an NGO as large as WWF is continuously involved in providing constructive viewpoints, participating in standards revisions, organizing groups of buyers, and thereby stimulating the demand for labeled products in several sectors (cf. Boström & Klintman, 2008). In 2009, NGOs were rated the most trusted organizations in society. Working with them to advance policy change or entering into multi-stakeholder initiatives brings credibility. Businesses cannot only emphasis that they are doing the right thing. The public will evaluate companies based on the opinions publicized by NGOs, which are viewed as independent and trustworthy organizations (cf. Wales et al., 2010).

Historically in the organic cases, NGOs have been prominent in promoting the cause of organic production and in providing support services for conversion to organic production and for internal control of production practices (cf. Carambas, 2005). In the case of product water footprint labeling, NGOs in Thailand cannot currently support knowledge of the water footprint concept to anyone owing to a lack of water footprint expert. As a consequence, international NGOs, such as WFN and WWF, should play a central role. Considering the rigorous standards or guidelines that will have to be complied before a PWFL can be issued, providing supervision, monitoring, and other assistance necessary to overcome the limited know-how of farmers about the appropriate implementation of water-friendly farming are unavoidable tasks of these NGOs. They will also be called upon to support exporting businesses in preparing water footprint accounting, thereby enabling them to comply with PWFL standards. NGOs also often take initiatives in building coalitions for labeling and in establishing labeling organizations.

In any case, international NGOs have to join forces with the governments of developing countries in establishing national or even global product water footprint labeling. Even if labeling is not initiated by NGOs, most initiators understand the need for NGOs to participate in eco-labeling, at least as advisors. The participation of generally appreciated environmental and social movement NGOs can bring the necessary trustworthiness to the project because of their moral authority, reflecting collectively shared values, voluntarism, and consumer

[50] Philanthropy etymologically means "the love of humanity" or the essence of our humanity. In modern practical terms, it is "private initiatives for public good, focusing on quality of life."
[51] Oxfam International is an international confederation of fourteen organizations working with over 3,000 partners in approximately 100 countries to find lasting solutions to poverty and injustice.

power. FoEI[52], Greenpeace, SSNC,[53] the Sierra Club,[54] and WWF can also be sources of new framing and sustainable expertise because they help to clarify, concretize, and popularize the meaning of ideas about natural food, precaution, sustainability, and biodiversity (cf. Boström & Klintman, 2008). WFN is the only NGO with expertise in water footprinting. As such, it has a role to play in product water footprint labeling. Dr. Zarate said that WFN would not develop a product label. However, if someone is willing to do so, and requires advice from the technical point of view on water footprint information, WFN would be willing to support this effort.

Since end consumers are generally an individualized and disorganized category of actors, NGOs such as Environmental Movers Organization (EMO) often play essential roles in mobilizing, empowering, demonstrating, and aggregating this kind of latent disorganized consumer power toward business and other audiences (Boström & Klintman, 2008). Environmental NGOs have emerged as influential forces and protests against irresponsible corporations have never been easier thanks to e-mail, the Internet, and other modern communications technologies (cf. Esty & Winston, 2006). Environmental NGOs are often the kind of actors that stage consumer boycotts, provide consumer recommendations, and promote consumer reflections (cf. Boström & Klintman, 2008). At the same time, they have the chance to educate consumers about PWFL and its sustainable effects.

In short, NGOs could either initiate the PWFL and certified product campaign, or put it forward to local governments or even exporting businesses. Either way, they have to work with local governments to set global water footprint standards, support knowledge about the water footprint for exporting businesses, and support necessary technologies and conversion periods for farmers. They also have to educate worldwide end consumers about the water footprint concept, PWFL products, and their sustainable effects. They must act as consumers' voices in order to observe and control both businesses' performance and governments' accomplishments. Finally, stimulating demand for PWFL products worldwide could be included in NGOs' assignment.

[52] "Friends of the Earth International" is an international network of environmental organizations in seventy-six countries. FOEI is assisted by a small secretariat (based in Amsterdam), which provides support for the network and its agreed major campaigns. The executive committee of elected representatives from national groups sets policy and oversees the work of the secretariat.

[53] The Swedish Society for Nature Conservation is a Swedish environmental organization.

[54] The Sierra Club is the oldest and largest grassroots environmental organization in the United States. It was founded on May 28, 1892 in San Francisco, California by the conservationist and preservationist John Muir, who became its first president. The Sierra Club has hundreds of thousands of members in chapters located throughout the US, and is affiliated with Sierra Club Canada.

5.4 Governments of Developing Countries

Empirical evidence has affirmed that regulated or government-sponsored labels are generally favored over others, as can be seen in the case of the carbon label in Thailand. The Thai government entirely supports carbon labeling by fully funding TGO. Moreover, MTEC, who works on the carbon label project, is also sponsored by the government. According to Dr. Zarate, governments pursuing product water footprint labeling as a strategy for water footprint reduction, need to fully educate themselves about the water footprint concept and the links between water footprint and water scarcity by consulting "The Water Footprint Assessment Manual," written by Professor Hoekstra, Dr. Chapagain, Dr. Aldaya, and Dr. Mekonnen and published on February 28, 2011. This book contains the global standard for water footprint assessment and covers a comprehensive set of definitions and methods for water footprint accounting. It shows how water footprints are calculated for individual products. The book explains that most of the water footprints of agricultural products occur in the cultivation phase. As a result, being funding from the Thai government is necessary to implement water-saving agricultural methods in order to reduce water footprints. After that, setting national guidelines for product water footprint labeling requires a close liaison among the Thai government, large exporting companies, farmers in the food and beverage sector of Thailand, and local and international consumer organizations, especially from countries that import Thailand's products. They should seek support from NGOs such as WFN, which has already set up some standards on water footprint accounting. Setting Thailand's national guidelines for PWFL is achievable. It might take a long period of time, but, it is worthwhile to set at least preliminary guidelines for PWFL of such significant exported products as rice, one of the most water-intensive crops (Hoekstra and Chapagain, 2008). There are a myriad of studies that deal with rice crops and their water footprints.

In Thailand, organic farming is an example of an eco-friendly industry in which the government incents exporting companies to set guidelines by providing technical and financial incentives. A large portion of those financial incentives go to certification costs, which is a large additional cost, especially when certification is done by foreign certifying agencies (cf. Carambas, 2005). In the case of the carbon label, the Thai government encourages businesses to participate by providing knowledge about carbon footprinting and by paying the costs of expert fees. According to Dr. Lohsomboon, other governmental organizations also support carbon labeling by providing information or training companies. CPF, as a representative of businesses in the food and beverage sector reported that as it participated in the carbon footprint pilot project, it was fully supported by the government in terms of carbon experts.

Since the water footprint labeling concept is new, the Thai government may not be able to provide technical incentives to exporting businesses yet. Nonetheless, it should be able to contribute financial incentives to companies in terms of water footprint expert fees or certification costs. The government also has to bear in mind that demand for water-friendly products is likely to exist in the future and Thailand's trade partners, such as European countries, may require water footprint information of imported products or even PWFL products, as is

the case for the carbon footprint. Providing at least financial incentives to exporting businesses is the way to secure Thailand's market share in the global market. The Thai government is also capable of requesting technical assistance with the Agreement on Technical Barriers to Trade (TBT),[55] in case the water footprint labeling standards are already established by importing countries. Thailand's government can request this assistance only if the national water footprint labeling standard is integrated into national economic development and poverty reduction strategies, so that bilateral donors and development assistance agencies learn about these needs from their national contact points. Only then, can developed countries acknowledge their obligations under Article 11 of the TBT Agreement[56] and begin to invest more in technical assistance regarding water-friendly know-how for developing countries like Thailand (cf. UNEP, 2005).

As mentioned in Section 4, the purchaser wanting to buy an eco-labeled product is not always the final consumer and due to disappointment of the eco-label campaign at the individual level, organizations that have campaigned for eco-labels had to change strategies by turning to large consumers such as the government, the largest consumer of the country (cf. PTT plc., 2010; UNEP, 2005). Moreover, anecdotal evidence suggests that long-term profits will not necessarily be any higher in eco-labeled markets than in conventional ones. It may be worthwhile to consider how preferential treatment in public and private procurement policies could help to make sustainable production more economically attractive than unsustainable alternatives. If it is not more economically attractive in the long run, it is unclear why market forces alone would prompt significant shifts in production patterns (cf. UNEP, 2005). Since 2008, the government of Thailand has endorsed a procurement policy for eco-friendly products. The ministry department and divisions will procure green label products and other eco-labels. If businesses want to sell their products to the government then they need to apply for an eco-label (cf. PTT plc., 2010). This strategy would also be compatible with PWFL products, if exporting businesses offered PWFL products in the global and Thai markets. In doing so, more PWFL products would be launched in the market, which raises alternatives for consumers to choose from and stimulates other local big businesses to launch these products as well. In the end, both the environment and society will benefit from the PWFL project.

Apart from the procurement of PWFL products, water footprint campaigning at the individual level is considered a long-term strategy that should be executed by the government. Such a campaign will gradually develop the conscience of the public by providing sound education, a vital mechanism in developing people's logical reasoning, understanding and realization that all human activities affect the environment (cf. PTT plc., 2010). As a result, everyone is responsible for easing the negative impact on water resources, the environment, and society.

[55] Technical barriers to trade (TBT) refer to technical regulations and voluntary standards that set out specific characteristics of a product, such as its size, shape, design, function and performance, or the way a product is labeled or packaged before it enters the marketplace. Included in this set of measures are also the technical procedures, which confirm that products fulfill the requirements laid down in regulations and standards.
[56] Article 11 of TBT Agreement refers to Technical Assistance to Other Members.

To sum up, the role of the Thai government, or of any government in a developing country, can be divided into two parts: supporting reduction of water footprints and promoting the PWFL scheme.

First, subsidizing producers in shifting from conventional to water-friendly cultivation and production is the prime engagement of the government. Due to the insufficiency of water-friendly know-how and technologies, requesting technical assistance from the TBT agreement is inevitable. Second, the government should thoroughly learn about the water footprint concept and use this knowledge to educate consumers in Thailand and to set the national water footprint labeling standards with participation from farmers, exporting businesses in the food and beverage sector, international NGOs, and local and foreign consumer representatives. Dispensing water footprint expert fees or certification costs for exporting businesses is predetermined as the financial incentive to conduct PWFL. Finally, the government's implementation of a PWFL products procurement policy will stimulate both domestic and overseas businesses to supply these products.

5.5 Worldwide Consumers

Following the Earth Summit on sustainability development in Rio de Janairo in 1992, producers argued that consumers also have accountability for the environment, society, and the world in order to help create a better planet for living (cf. PTT plc., 2010). Similarly, in the view of Hoekstra and Chapagain (2008), as well as Geiger and August (2010), consumers are not free from responsibility for possible negative effects such as water depletion or pollution that result from the production of the goods that they consume, even if production and its effects occur in one country and consumption takes place in another. The proverb says that when a consumer buys stolen goods, the receiver is as bad as the thief. This principle is embedded in legislation in many countries. By the same token, why would consumers of products that were produced in an unsustainable way be any better than the producers? As a result, producers and consumers must bear responsibility for problems caused during the production stage of commodities by first and foremost educating themselves about water and food security.

The PWFL can furnish end consumers with the connection otherwise hidden between consumption and water use. It informs people that the consumption of a certain good in one country relates to a problem of water depletion or pollution in another country. By preparing water footprint accounting, the connection between European cotton consumers and the desiccation of the Aral Sea, as shown in Figure 5.1, was revealed. The Soviet Union established its cotton-producing areas in Uzbekistan, Turkmenistan, Tajikistan, and Kyrgyzstan and developed irrigated agriculture on a large scale to produce cotton for export in the 1960s. The irrigated area has grown to eight million ha, using practically the entire available flow of the two main rivers, the Amu Darya and Syr Darya. Water problems are mainly due to the inefficient allocation of water resources and overreliance on irrigation in the agricultural sector.

The emphasis on intensive cotton cultivation in the Aral Sea Basin countries has played a major role in the drying and polluting of the Aral Sea because of the large amounts of water and fertilizer used in cotton cultivation (Aldaya et al., 2010). This case shows that the agricultural sector could not have grown the way it has done since the industrialization of agriculture without massive irrigation (Tschochohei, 2008).

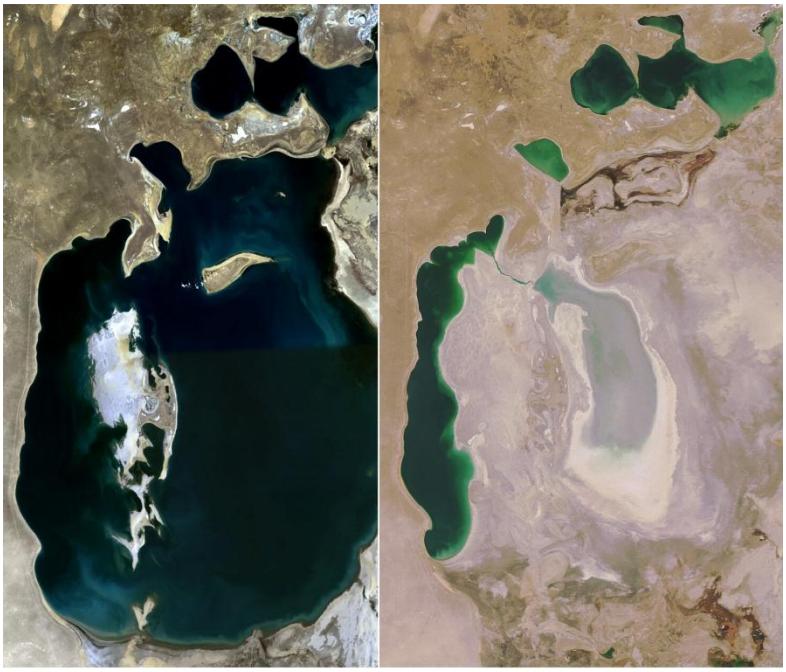


Figure 5.1: Comparison between the Aral Sea in 1989 and 2008 by NASA [18]

Due to globalization and trade liberalization, food is being bought and sold worldwide, which implies that water is “virtually” traded as well. To date, 16% of global water use is not for producing products for domestic consumption, but for producing exports. Given that on average agricultural production for exports does not cause significantly more or fewer water-related problems than production for domestic consumption, roughly one sixth of the water problems in the world can be traced back to production for export (Hoekstra & Chapagain, 2008). As a result, if exported food is properly produced by using water-friendly methods, then one sixth of the world’s water problems could be solved. It can be said that food-importing countries are dependent not only on the food of exporting countries, but also on their water resources.

Country	Internal water footprint (10^9 m^3/y)	External water footprint (10^9 m^3/y)	Water self-sufficiency† (%)	Virtual-water import dependency‡ (%)
Thailand	123	11	92	8
Germany	60	67	47	53
Japan	52	94	36	64
UK	22	51	30	70
Jordan	1.7	4.6	27	73
Netherlands	4	16	18	82

† Defined as the ratio of the internal to the total water footprint
‡ Defined as the ratio of the external to the total water footprint

Table 5.1: Virtual-water import dependency of selected countries over the period 1997-2001 (source: Hoekstra & Chapagain 2008)

Table 5.1 presents virtual-water import dependency, which can be defined as the ratio of the external water footprint of a country to its total water footprint. The internal water footprint is defined as the volume of domestic water resources used to produce goods and services consumed by inhabitants of the country, whereas the external water footprint of a country is defined as the annual volume of water resources used in other countries to produce goods and service consumed by the inhabitants of the given country (Hoekstra & Chapagain, 2008). Countries with a very high degree of water scarcity such as Kuwait, Saudi Arabia, Jordan, and Israel indeed have a very high virtual-water import dependency, more than 50%. Each year, Jordan imports a virtual-water quantity five times its own yearly renewable water resources. Although this saves its domestic water resources for other uses, it makes Jordan heavily dependent on the water resources of other nations. Even European countries that do not have an image of being water scarce, such as the UK, the Netherlands, Germany, and Switzerland, have a high virtual-water import dependency, mostly due to food importing. The increasing lack of self-sufficiency has made various countries very vulnerable. If food supplies in the main exporting countries cease due to water shortage or pollution, the importing countries will suffer severely (cf. Hoekstra & Chapagain, 2008). As Table 5.1 indicates, Thailand is ranked as a high water self-sufficiency country, which means that it does not rely on food import and its inhabitants consume domestic food.

Figure 5.2 demonstrates how water can be transferred virtually from Thailand to other trade partners by the export of rice. Thailand exports 27.8 billion m^3/y of water, in the form of rice, mostly grown in the central and northern regions. The money equivalent of rice export is 1,556 million U.S. dollars per year. As a result, Thailand is generating foreign exchange of 0.06 U.S. dollars/m^3 (Hoekstra & Chapagain, 2008). In 2010, one cubic meter of irrigated water in Thailand cost approximately 10 Baht/m^3, which is equal to 0.33 U.S. dollars/m^3. Water used in rice farming comes from both rainwater and irrigation water. According to the report of Chapagain & Hoekstra (2010), about 37% of water use in rice production in Thailand is irrigation water. Without water footprint accounting one cannot be sure whether or not the price of exported rice covers at least the cost of water use. The problem further increases if the cost for irrigation water rises, as it has in the past few years. As a consequence, if Thailand faces water problems such as drought or water pollution, its central trade partners: In-

donesia, Malaysia, Nigeria, Senegal, Iran, the U.S., and China, will also have to cope with an insufficient rice supply.

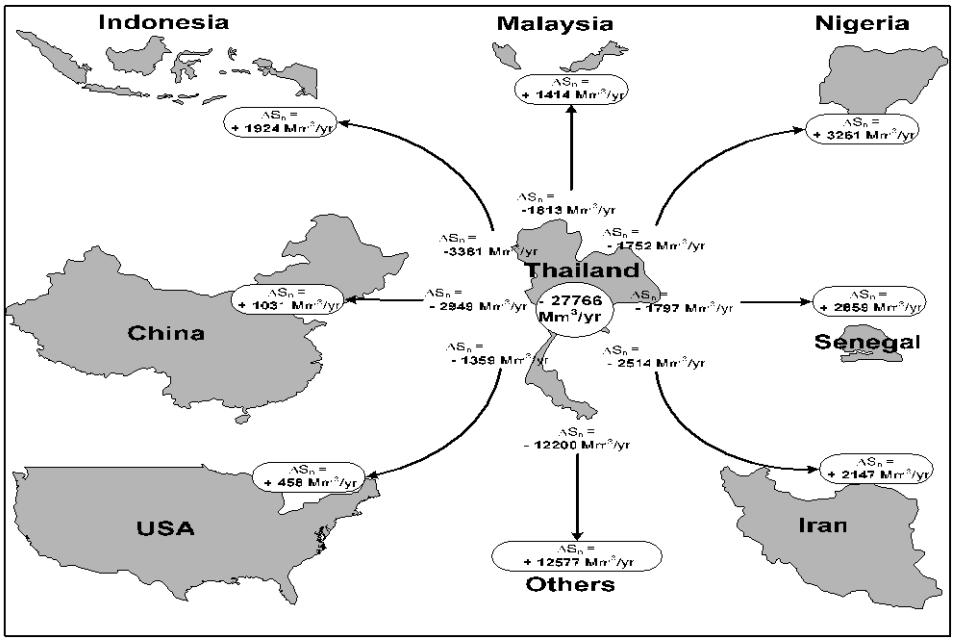


Figure 5.2: Virtual-water export of rice from Thailand (source: Hoekstra & Chapagain 2008)

Figure 5.3 illustrates which countries are net importers of virtual water and which are net exporters. The largest net exporters are Australia, the U.S., and Canada, whereas the regions with the largest net import of virtual water are the EU, Japan, Mexico, North Africa, and the Arabian Peninsula. Nevertheless, within the EU, France is an exceptional case, which can be explained by its export of cereals (Hoekstra & Chapagain, 2008).

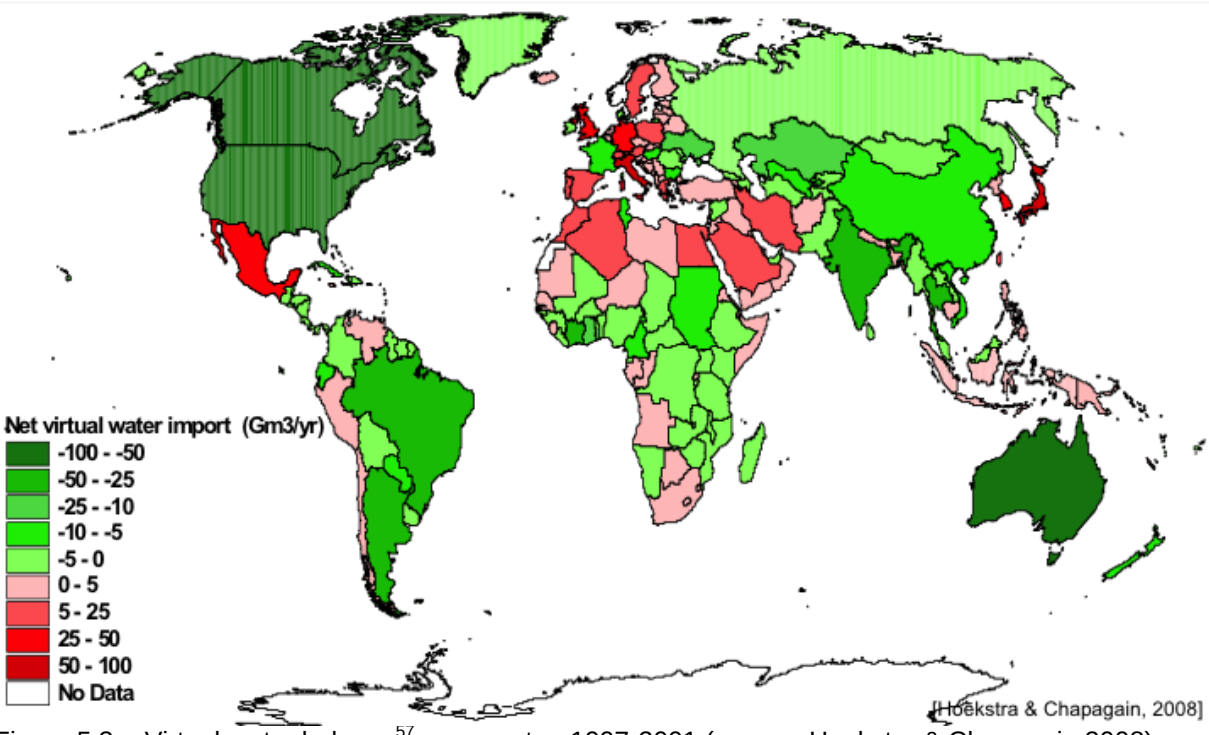


Figure 5.3: Virtual-water balance[57] per country, 1997-2001 (source: Hoekstra & Chapagain 2008)

[57] A national virtual-water flow balance can be drafted by subtracting the export volume from the import volume.

Water subsidies in wealthy countries have implications beyond the border, especially for exported by the EU and the U.S. When the U.S. exports water-intensive crops such as rice, it is also exporting very large virtual-water subsidies. Producers in other exporting countries such as Thailand and importing countries such as Ghana have to compete in markets distorted by these subsidies (UNDP, 2006).

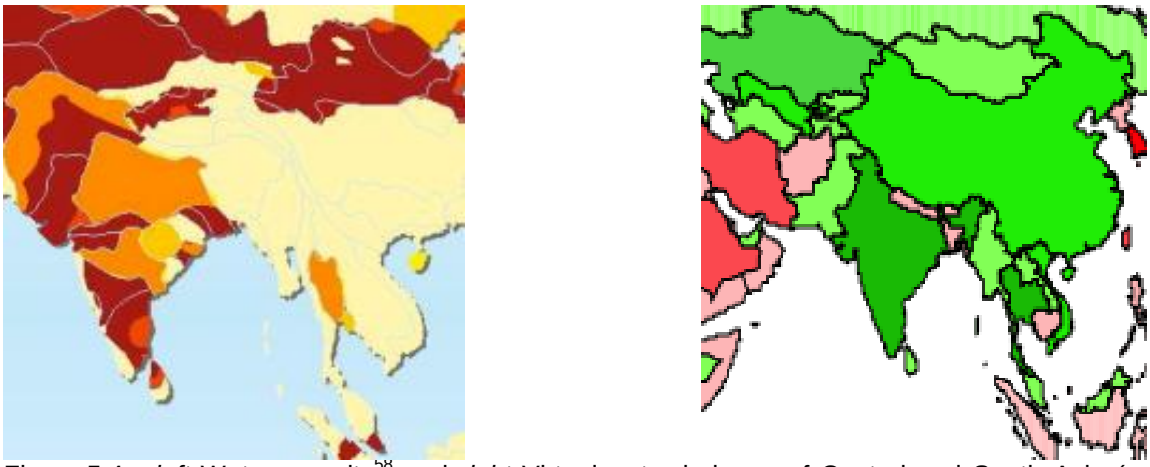


Figure 5.4: *left* Water scarcity[58] and *right* Virtual-water balance of Central and South Asia (source: adapted by the author)

Figure 5.4 *left*, shows that Central Asia, India, and some parts of Thailand face moderately to over-exploited water resources; however, they are still net exporters of virtual-water who produce food for other countries (see Figure 5.4 *right*). This means that they use limited or already scarce water resources to produce and export food for other countries that have plenty of water such as Sweden, Finland, and the UK. For example, in Thailand, one cubic meter of water is valued at less than 0.06 U.S. dollars. Given all the resources consumed in the production process, including water, land, and labor, the benefits are on the consumption side (Hoekstra & Chapagain, 2008). Water is generally grossly underpriced (Rogers et al., 2008) and the environmental cost is excluded from the price of commodities; thereby, the costs, once more, remain on the production side (cf. Busse, 2006; Hoekstra & Chapagain, 2008). It can be concluded that the price of products cannot cover the full costs, especially the environmental costs, of water consumed in the production process. As a result, in order to lessen unsustainable use of water and water problems, applying another market tool is unavoidable.

The impact of water scarcity or water pollution in Africa, South Asia, or Southeast Asia must not be underestimated. European consumers will experience this impact in the form of insufficient food, increasing prices for basic commodities, or even food shortages, especially in the winter season. It is true that not only water is necessary to produce food but also appropriate temperature and land. The point is if the conditions of food production in developing countries, such as the unsustainable use of water and the overuse of fertilizer in agriculture,

[58] Please consult with Water scarcity index on page 2

remain the same, then it is likely that most of the watersheds in those areas will face severe depletion and pollution, just like the Aral Sea. In the worst case, this will result in deficient water for agricultural use in developing countries and will seriously affect food-importing countries. The fact is that the main food exporters are developing countries (cf. Hoekstra & Chapagain, 2008; Weissmann, 1999), which normally have poor water management and technologies because of a lack of knowledge and financial constraints. In contrast, developed countries basically play a role as food importers who own knowledge and technologies regarding water management and operate under a larger financial budget. The normative question at the global level is whether wealthy water-rich nations should play a role in supporting developing water-poor nations (cf. Busse, 2006; Hoekstra & Chapagain, 2008). Concerning the relationship between food and water, as mentioned above, they must take action in order to preserve water resources in exporting countries and protect their own food security. Product water footprint labeling provides room for them to play by demanding PWFL products from their trade partners, which will trigger and indirectly force exporting countries to cultivate their exported goods with water-friendlier approaches. Grote et al. (1999) pointed out that labeling is an effective device to pursue in countries that are relatively rich or, in other words, developed countries.

Not every consumer is concerned about the sustainability of water resources, and not all consumers will ever be interested in expressing their convictions in supermarkets. Labeling agents cannot engage the entire population but maybe they can engage half of the population such as in Sweden (cf. Boström & Klintman, 2008). To achieve the policy objectives of the PWFL, consumers must have preferences for certain environmental amenities and respond to the information presented on the label by altering purchases toward PWFL goods. If social and ecological aspects are entangled with individual benefits, such as taste and health, then PWFL products have a good chance of being marketed successfully (cf. Belz, 2005; Schmid et al., 2005). Consumers should select the beef or coffee that has a relatively low water footprint or that has its footprint in an area that does not have high water scarcity (Hoekstra et al., 2011). This requires that consumers have the proper information to make that choice, which can be fulfilled by product water footprint labeling.

The PWFL plays an important role by informing consumers how much blue water was consumed and how much grey water was released during the manufacturing of the product. It also delivers a water footprint reduction derived from water-friendlier production processes of the business (consult with Figure 2.4). These labels give consumers a chance to gain information regarding how water resources were managed and used. For example, it reveals in which catchment blue water was consumed and where grey water was released. Consumers can use this information and take it a step further by searching for more information on the Internet. For example, they can find out whether blue water was consumed in the catchment that suffers from drought or water pollution problems, which can lead to environmental drawbacks such as depletion of the watershed, and social conflicts, such as unfair water allocation or insufficient clean water in communities around the watershed. Consumers in developed countries are likely to do this kind of research, but Thai consumers still lack awareness

of water scarcity issues and proper education about environmental effects, and thus are unlikely to search for this kind of information. However, there is still potential for Thai consumers to change. A number of people, institutions, and other factors need to cooperate to make change happen (cf. PTT plc., 2010).

In addition, consumers could play the role of PWFL stimulators by asking for water-intensive product transparency from exporting businesses and by requesting the water footprint labeling standard from the Thai government. These consumers could be environmental or social activists, as well as inhabitants who are affected by exhaustion of water resources or contaminated river water due to businesses' operations. When sufficient information is available, consumers can make conscious choices about what they buy in order to preserve precious water resources, which finally sustains the eco-system of the planet (cf. Busse, 2006; Hoekstra et al., 2011). At the end of the day, consumers themselves will benefit from their consumption of small-water-footprint products. "Save water. Save thyself."

Ideally, to keep virtual water transfer reasonable, countries that have plenty of water have to produce water-intensive crops and export them to water constrained countries. However, this is not going to occur in reality due to such factors as climate, land, labor costs, and opportunity costs. As a consequence, water-friendly cultivation should be implemented in exporting countries in order to sustain their water resources. Unfortunately, most of them are developing countries, which lack the know-how and financial budget. They will not start to change the way they produce the product unless there is a suitable incentive. PWFL could be used as a market incentive for them to start shifting their production processes to water-friendly ones. Consumers, who have seldom or never used their purchasing power to control the behavior of businesses, must do so now (cf. Busse, 2006). It is time for consumers to realize that they are responsible for water problems in the society that produces their products, and they are able to solve these problems. Through demanding PWFL products, they could force businesses to improve their production processes to use less water. Moreover, they could even inquire about water footprint labeling standards from governments of developing countries.

The power of consumers must not be undervalued because everyone on this planet is a consumer (cf. Busse, 2006). If one starts to consume a PWFL product, then perhaps one's family, one's community, one's region and then one's country will follow. The unsustainable use of water resources by the companies that produce our products could be stopped, if consumers acknowledged that, to some extent, this is caused by their own ignorance or recklessness. In failing to do so, consumers have indirectly supported the unsustainable practices of companies, and if nobody is seriously concerned with this dilemma, these practices will directly affect the next generation and lead to a more water-constrained world.

5.6 Stakeholders Share Responsibility

With respect to the globalization of the food trade, water scarcity in one country can have unexpected negative consequences on another country on the other side of the world. The severity of these consequences is not easy to estimate. As a result, water crises must not be classified as regional crises, but rather as global crises, which require cooperation among all countries. No institution can manage the challenges of water scarcity alone. This is why partnerships are so important (Wales et al., 2010). Due to the fact that water is a public good, businesses must not be the only ones who take responsibility for water resources. As a consequence, it is recommended that consumers, governments, investors, and NGOs play a role and participate in global corporate responsibility (cf. Busse, 2006). The PWFL is not just another business marketing plan to produce more profit. Its ultimate purpose is to solve water scarcity and water pollution, at least to some extent. Basically, businesses are experts at identifying consumer trends and in responding to them, so if consumers are interested in water-friendly products, businesses will respond by stocking them and promoting their ecological and ethical credentials. This is a win-win-win situation for consumers, businesses and governments, and the environment and society. Consumers can make a sustainable choice with regard to water resources more easily, with market competition keeping prices in check as well. Businesses that get this right will see their market shares grow, and governments can use the collective spending power of the water-saver pound, dollar, yen, or even baht to help deliver their environmental and social policy goals. Ultimately, freshwater will be preserved and wastewater will be reduced, leading to food security and improved social welfare (cf. Wales et al., 2010). In order to successfully promote and market the PWFL, all benefits and costs from the customer's point of view have to be taken into account. If PWFL products have a higher perceived value than conventional products, they will be bought and used (cf. Belz, 2005). Many types of eco-labels are not likely to be successful in the absence of complementary public or private policies. A study of the Organization for Economic Cooperation and Development (OECD)[59] identified several factors as critical to the success of the Blue Angel program. One of these factors is campaigning by consumer organizations and the media, particularly the local media and specialized press, targeting some product category labels at professional purchasers. Other key factors include public procurement policies that support the Blue Angel program, and anticipated consumer preferences (cf. UNEP, 2005).

Figure 5.5 illustrates the roles that important stakeholders can play in pursuing the reduction of water footprints and the launching of product water footprint labeling.

First, farmers have to learn and understand the water footprint concept. Due to constraints in financial resources and knowledge, farmers also require support from exporting businesses

[59] The Organization for Economic Cooperation and Development (OECD) is an international economic organization of thirty-four countries founded in 1961 to stimulate economic progress and world trade. It defines itself as a forum of countries committed to democracy and the market economy, providing a platform to compare policy experiences, seeking answers to common problems, identifying good practices, and coordinating the domestic and international policies of its members

and international NGOs in order to fulfill their two important tasks of reducing water footprints of cultivated commodities and collecting information regarding water footprint. Second, exporting businesses need to thoroughly learn and understand the water footprint concept, reduce the water footprint in their production processes, and collect water footprint data. The water footprint derived from operational processes can be decreased by finding the hot spots of water consumption, setting water footprint reduction targets, and using benchmarks of water footprint reduction among factories. In order to indirectly control the water footprint in their supply chain, supply agreements should be signed with main suppliers. With regard to the PWFL, exporting businesses could begin by preparing a more water-friendly transformation plan in order to avoid bottlenecks that are likely to arise during the conversion period. Information about the water footprint must be collected and assembled in order to generate water footprint accounting. After that, exporting businesses could propose the PWFL or even launch it themselves. Communicating with the public is necessary to promote PWFL products by creating a stakeholders' dialogue. International retailers could support exporting businesses by shouldering costs related to certification bodies or by collaborating with them in proposing or launching the label.

Third, conducting the marketing of PWFL products requires the joint effort of exporting businesses and international retailers. International NGOs, such as WFN, have to provide know-how about water footprint accounting to exporting businesses, and could either propose the PWFL to exporting businesses or governments, or initiate it themselves. They must act as a bridge between consumers and exporting businesses and become the voice of consumers in stimulating demand for PWFL products. The government's engagement is comprised of funding farmers to implement water-friendly cultivation and applying for the TBT Agreement in order to gain support from developed countries in terms of know-how and technical transfer. During the nascent stages of the water footprint concept, governments have to become educated about this concept as well. Additionally, providing financial incentives for exporting businesses interested in promoting the PWFL in the form of expert fees or reimbursement of certification costs is strongly recommended. A water-friendly procurement is an effective method of prompting PWFL products in developing countries. Educating consumers requires cooperation among local governments, international NGOs, global retailers, and exporting businesses.

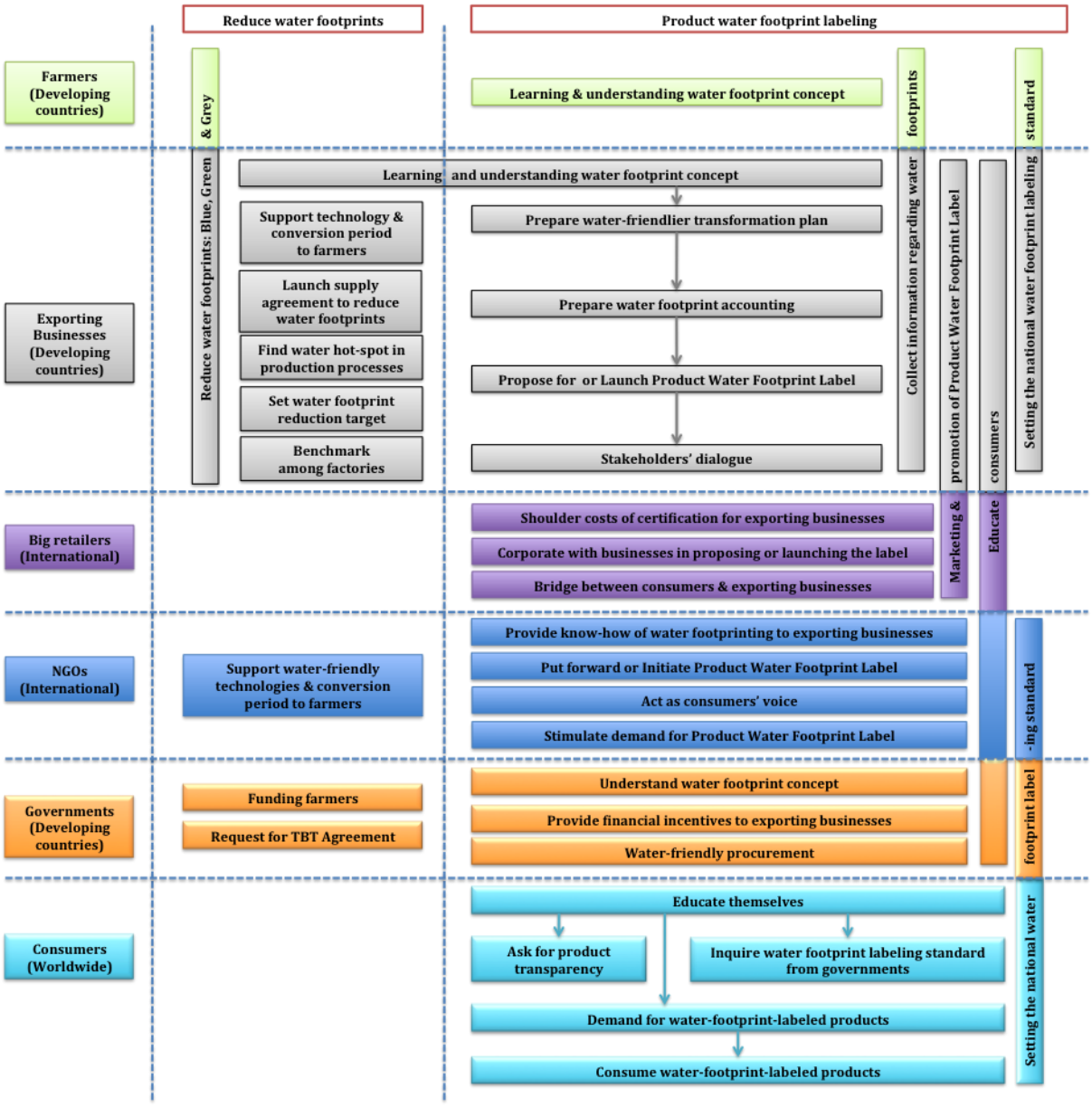


Figure 5.5: Roles of stakeholders in promoting PWFL (source: compiled by the author)

Finally, consumers have to educate themselves about PWFL products and request product transparency regarding the water footprints of products from exporting businesses. They must also inquire about water footprint labeling standards and have to participate in setting the national water footprint labeling standards, together with the government, international NGOs, exporting businesses, and farmers. Demand for PWFL products is undoubtedly necessary in order to create a supply of these products, and consumers must choose and consume PWFL products.

6. DISCUSSION, SUMMARY, AND OUTLOOK

6.1 Discussion

The following paragraphs address the advantages and disadvantages of the PWFL, low consumer awareness of eco-friendly products in Thailand, and the challenges of conducting water footprint accounting of a product.

6.1.1 Pros and Cons of the Product Water Footprint Label

Under perfect competition, consumers express their needs and desires as a demand, and companies react to those demands by supplying the goods and services that consumers require. Nonetheless, there are limitations in practice. For example, although consumers do not have the time or the capability to check all data on all products, they expect to have information about environmental and social issues when they make purchase decisions. They want to know the history of the food commodities they buy, but have no way of testing ecological and sustainability attributes based on physical appearance (cf. Belz & Pobisch, 2005; Nordic Council of Ministers, 2008; Wales et al., 2010). As a result, the adoption of eco-labels is seen as an opportunity for increased sales through product differentiation, increased accountability, or increased choice for consumers in a "greening" retail environment. The reality differs. There are too many products, too much information, too little time, and a shortage of independent, readily accessible, and understandable information about environmental performance (Institute of Consumer Sciences Incorporating Home Economic, 2009). All of these factors decrease transparency for consumers. Eco-labeling is currently one of the main consumer information tools that exists in markets around the world. It can, and in some cases already does, provide information to any actor making purchasing decisions on the basis of environmental and ethical characteristics (cf. UNEP, 2005). With respect to the survey questionnaire, some respondents raised two important arguments against the PWFL. The first argument is addressed in Section 6.1.1.1 and the second argument is discussed in Section 6.1.1.2.

6.1.1.1 Product Water Footprint Label as a Solution for Water Scarcity

Some respondents argued that it is easier to create sustainable use of water through governmental water policy, which directly regulates the way farmers and businesses use water. Government regulation, they claim, can effectively manage water resources, therefore making a market-based instrument such as the PWFL unnecessary. While there is little doubt that government regulation holds the potential to solve water issues, the crucial question is when such regulation would be passed. The price of water is low in most regions, and efforts to increase the price are complicated and will take more time than launching the labeling scheme. It is also true that the government may be able to create policies that compel all sectors in the country to use less water in their operations. However, these practices often take time to move through the layers of government bureaucracy. Exporting businesses are smaller and have smaller financial budgets than governments. Thus, they can move faster

with more flexibility and less bureaucracy. In fact, they are not too small to launch PWFL (cf. Boström & Klintman, 2008). Waiting for government action is not enough, since that action will come presumably too late to solve the water crisis.

If consumers are aware of water issues and demand water-friendly products, then a visionary business will try to offer these kinds of products at any cost by using less water in its production processes along the supply chain. When consumers become educated and informed about the relationship between water and food, demand for PWFL products will tend to increase more quickly in water-dependent countries, such as the European countries, than in water-sufficient countries, such as Thailand. As a consequence, preparing for product water footprint labeling will contribute to the competitive advantage of exporting businesses. These practices will take significantly less time to launch than governmental policies on the price of water or water management.

6.1.1.2 Product Water Footprint Label Increases the Prices of Basic Food

Survey respondents contended that the PWFL tends to increase the price of basic commodities and push the cost onto innocent consumers, especially in Thailand where the majority of inhabitants is poor. As already indicated in Section 3, the price of eco-labeled products such as carbon-labeled products remains the same in Thailand. As a result, businesses bear the additional costs rather than Thai consumers. However, even if there is a price premium on PWFL products, it should be acceptable because there are still plenty of substitute commodities and conventional products in the domestic market. These PWFL products are intended mainly for the global market. Only a minority will be offered in the domestic market. Hence, the majority of Thai consumers will not be affected by the markup price of PWFL products. Only water-concerned consumers, including individual Thai consumers and consumers in developed countries, will presumably share responsibility for the global resources of the planet by choosing PWFL products instead of other substitute products. They will view the markup price as insurance to secure the water resources of various catchments in exporting countries, which ultimately protects not only the eco-system of these regions, but also their own food supply.

6.1.1.3 Product Water Footprint Label as a Communication Tool

In the context of future trends, it is important to realize that eco-labels are not the only important communication tool that purchasers will accept. The need to actually apply a label depends on the nature of the relationship between the producer and customers, either individual consumers or commercial buyers. In the case of organic agriculture, where the majority of customers are individual consumers, a mass market is being supplied by an entity with which the vast majority of consumers have no direct relationship. The consumer is also unlikely to have the capacity to perform tests to ensure that the product is in fact organic, and probably has very minimal ability to sanction the producer if the producer is found to be dishonest. Thus, a physical label is needed in order to overcome a lack of trust between producer and consumer. Nevertheless, in the case of the FSC certification and label, the rela-

tionship is between the producer and a relatively limited number of buyers. It is quite likely that the producer and buyers have maintained a relationship over a number of years, and so understand and trust each other. It is true that the purchaser does not have much capacity to determine whether a product is actually from a sustainably managed forest, but the purchaser, unlike individual end consumers, has considerable ability to sanction a dishonest producer by denying their future supply contracts. Given the market power of retailers like IKEA, Home Depot, and B&Q,[60] this is not something most producers would risk. The lesson here is that the physical application of a label is not always important to the effectiveness of a market-based initiative to promote sustainable production. Labels are likely to be important when initiatives promote sustainable consumption, but only if the customer is the individual consumer (cf. UNEP, 2005).

Dr. Lohsomboon agrees that labeling is still a useful tool to communicate with end consumers. An effective label, she explains, should clearly communicate its objective and have a brief explanation on the product packaging, which gives consumers a chance to read before they make their purchase decision. The product labels that have taken off and caught the public's attention have tended to deal with a single-issue and focus on a specific product. Examples include free-range eggs, which responded to public concerns over battery-farming of chickens, and dolphin-safe tuna, which followed an exposé of fishing practices (Wales et al., 2010). With regard to Browne et al. (2000), it is possible to combine organic certification with other eco-socio labels such as fair trade. Fair trade criteria include some limited environmental aspects. An increasing number of fair trade products, notably coffee, tea, and cotton, are also becoming accredited as organic. According to Dr. Aldaya, the PWFL should be integrated into broader labels that include other issues such as energy and fair trade. However, the author recommends applying it with some organic labels, since organic labels are more relevant to PWFL than energy and fair trade labels in the context of food products and grey water footprints that can be reduced by organic agriculture. An organic PWFL product offers end consumers healthy food for themselves as well as a healthier water catchment for the community. Furthermore, it should be noted that eco-labels like FSC are used as a "license to play," whereas PWFL is categorized as a voluntary label. In the first case, wholesalers and retailers seem to be more important as decision makers. However, in the second case, end customers exert more influence. A relevant question is whether there is consumer demand for water-friendly products or not. The consumer demand for PWFL products depends upon whether or not consumers are aware of the PWFL, which is further discussed in Section 6.1.2.

[60] B&Q Plc is a British retailer of DIY and home improvement tools and supplies. It was founded in 1969 and is the second largest DIY retailer in Europe, the largest in China and the fourth largest in the world, behind The Home Depot, Lowe's and OBI.

6.1.1.4 Product Water Footprint Label Provides Insufficient Information

There are obviously some issues with eco-labels in terms of consumer's confusion and incomplete information. While the water footprint is an excellent tool for companies to begin to understand their water use, care must be taken when communicating about the water footprint of a product. As mentioned in Section 2, numeric water footprints on labels do not provide information needed to make informed choices among products and consumption practices and would not reflect the complexities behind the calculation. Nor would they convey the impact that the water used to produce one product is having on the local watershed (The Coca-Cola Company, 2010). This implies that the complexities of the water footprint of a product cannot be communicated to end consumers by a label, and thus, other methods should be used to accomplish this task. According to a report by the UK Environmental Audit Committee (2009), adding a URL on the front of the package might spur consumers to actually log onto the website using mobile devices such as Blackberries or iPhones when they are shopping. While this might make shopping much more exciting for some consumers, it is probably not going to happen, especially in Thailand. Dr. Lohsomboon, as a label practitioner in Thailand, comments that adding a URL on a product might be effective in Europe, but not in Thailand because Thai consumers are not accustomed to finding information on their own. Another possible method might be to invest in television advertisements, using them to provide information about the value added to the product, but this would be costly. Dr. Lohsomboon also agrees that using a label is better than putting a URL on a product, if there are proper public relation campaigns and if consumers are well educated about the label. Correspondingly, Mrs. Kimsri argues that a label is sufficient only if consumers are already familiar with the label and know its meaning. Even if there was no specific figure on the label, it would work, if consumers were well informed and educated. For example, if consumers knew that in order to get a PWFL the producer has to reduce water use in the production process by 10%, then PWFL would be effective. As a result, consumers could make decisions at a glance upon seeing a PWFL product. So, in this case, numeric figures might not be displayed on the label. However, some consumers might want to know exact figures. For this group, a URL or QR code could be added on the packaging so that they can find that answer on their own.

In essence, having some kind of labeling system like product water footprint labeling, that makes it simple for end consumers to take in information at a glance once they are familiar with it, will ultimately lead to great benefits in terms of consumer information and sustainable use of water resources.

6.1.1.5 Product Water Footprint Label VS Product Water Footprint Report

Some may claim that a product water footprint report in a company's sustainability report, can provide more information about water footprints in terms of volume, local, or even the impact of water footprints. Dr. Lohsomboon comments that only researchers, investors, or institutions will read company annual or sustainability reports, not end consumers. Thus, labels are suitable for communicating with end consumers and reports are appropriate to con-

vey information to other stakeholders. Mrs. Kimsri, of CPF, expresses that if there are many labels on a product, it means that end consumers of the market accept those labels. As a consequence, producers try to get as many labels accepted on their products as possible. It seems that labeling is the most practical approach to communicating with end consumers; however, they are not the only interested party of a company. While some groups of stakeholders pay attention to sustainability reports, other groups feel that labels are more important. Sustainability reports serve as a kind of business-to-business communication for shareholders, investors, and trade partners. Mrs. Kimsri assumes that the same source of information is used to publish a report and to launch a label, but slightly different information is included in each. Furthermore, she adds that a label on a product can give consumers useful information about the product and its relationship to the environment, which is longer lasting than a campaign, if consumers are aware of the label. Dr. Aldaya explains that the goals of sustainability reports and water footprint labels are different. Some consumers do not have the time to read a whole report and need a summary of the relevant information when making quick consumption choices. The report could be made available online for those consumers and other stakeholders who are interested.

In conclusion, the author agrees with the comments mentioned above that the PWFL is more suitable for end consumers than a water footprint report, which should be used as a communication tool between businesses and other stakeholders such as investors and trade partners.

6.1.1.6 Limitations of Product Water Footprint Label

TCCC (2010), a pilot company that has already calculated water footprints for its products, addressed the limitations of a PWFL as follows. First, as mentioned in Section 6.1.1.4, it is important to understand the meaning of the aggregated number of the product water footprint. Although the concept of a water footprint can raise public awareness of the various dimensions of water use, consumers and many company leaders often focus only on the gross numbers. They react by trying to make the numbers smaller, without considering context. A product water footprint figure by itself lacks crucial information and can deliver the wrong message that any water use is bad, which in the end may lead to an inappropriate response strategy. In reality, a small water footprint in a drought-prone watershed may have a much more significant impact than a large water footprint in a water-rich region. Comparisons between water footprints must be carefully considered to ensure that they reflect the same scope of operation and supply chain. Second, when site-specific data are restricted, as is often the case, the use of public data sources will result in similar products having the same water footprints. For example, in the absence of site-specific data, orange juice produced by two companies that source from the same countries will have the same water footprint because operational water footprints are small, and any differences will be overwhelmed by the crop water footprint.

PWFL can overcome some of the restraints mentioned above. It furnishes information about two kinds of water footprints, blue and grey water, and provides information about the sources of blue water consumption and the location of released grey water. Moreover, the label presents benchmarks for each kind of water footprint. This provides consumers a chance to compare the company's performance with the benchmark, and a particular PWFL product with other PWFL products that consumed water in the same watershed or generated wastewater to the same location. Unfortunately, it cannot overcome the limitation that a label should offer a chance to compare PWFL products from drought-prone watersheds with PWFL products from water-rich regions. This might be possible only if consumers have information about the degree of water stress of both watersheds.

	A	B	C
Blue water footprint	57 liters	27 liters	632 liters
Blue water benchmark	72 liters	72 liters	727 liters
Catchment	O	O	P
Degree of water stress	overexploited	overexploited	water-abundant

Table 6.1: Comparison among PWFL products (source: compiled by the author)

Table 6.1 illustrates an example. If product A has 57 liters of blue water, mainly from the "O" catchment, product B contains 27 liters of blue water, mainly from the "O" catchment as well, and product C has 632 liters of blue water mainly from the "P" catchment, the benchmark of both A and B is 72 liters of blue water, while C's benchmark is 727 liters of blue water. As a result, it is clear that all of these products are water-friendlier than other non-labeled products and product B is more water-efficient than product A, though it might be more expensive than product A. At this stage, consumers have to weigh the benefits for water resources against the additional cost. Nonetheless, consumers may face information barriers in comparing products B and C owing to their different water catchments and benchmarks. If the "O" catchment is an overexploited catchment, whereas the "P" catchment is a water-abundant catchment, this means that product B has a small water footprint in a drought-prone watershed, while product C has a large water footprint in a water-rich region. As a consequence, product B may have a much more significant impact on water resources than product C, regardless of the values of their water footprints. By using this information, consumers can make a more valid comparison between them and make a well-informed decision. The second issue addressed by TCCC will be discussed in Section 6.1.3.

6.1.1.7 Summary

According to Dr. Lohsomboon, it is true that labels are not the best way to inform people about products' impact on the environment. Rather, education, books, and websites that provide the best information about day-to-day impact, such as offering carbon calculations for each person as well as an individual water footprint. The author agrees with Dr. Lohsomboon that PWFL may not be the best way to inform consumers about products' impact on water resources; however, PWFL should be used as a driver to more sustainable use of water in the food and beverage sector. It should also be seen as a symbol that helps consumers make purchase decisions based on a concern for water.

With regard to Nilsson (2003), Busse (2006), and Wales et al. (2010), the Internet allows incredible interactivity between consumers and their ultimate suppliers. Companies have only begun to scratch the surface of what that could mean. In order to deliver information to the PWFL target group, the author concurs that the Internet is a practical communication channel. Currently, WFN offers a lot of information regarding various kinds of water footprint concepts on its website. As a consequence, knowledge about the water footprint is available for every interested consumer who has access to the Internet.

6.1.2 Low Consumer Awareness of Eco-friendly Products in Thailand

In order to launch the PWFL, a certain degree of consumer awareness is necessary. Currently, there are no studies about consumer awareness of water issues or the water footprint concept related to a product. As a result, only Thai consumer awareness, gathered by in-depth expert-interviews and the survey questionnaire, are available for evaluation.

According to the MRE Foundation (2000), the labeled product must be differentiable from the conventional product, which means the label must be obvious to and trusted by the consumer. This can be accomplished with a well-functioning labeling mechanism and through consumer education. Dr. Lohsomboon agrees that basic educational background is important, but how to transfer information to end consumers is also an issue. It requires many factors, such as effective public relations and a financial budget for advertising. According to Dr. Lohsomboon's experience, advertisements are one way to create awareness among the Thai population. As a result, TGO has arranged carbon footprint campaigns for consumers. However, consumer awareness of the carbon footprint is still low. In the case of green labels or other eco-friendly products, people who buy these products are already green consumers. Whether labels can change a conventional consumer into a green consumer, is still ambiguous. In the case of No. 5 energy-saving labels, which are the most energy saving label on electric products in Thailand, consumers can make a connection between environmental issues and cost savings. When they see this label, they know that they can save energy and money at the same time. Though buying these products makes their lifestyle "greener," it is unclear whether their purchase is motivated by a desire to be greener or just a desire to save money. Dr. Lohsomboon concludes that it is very difficult to create green products in general and PWFL products in particular, through demand from Thai consumers. Mrs. Kimsri comments that at the beginning, the image of carbon labeling was not clear, and only small groups of people knew what a carbon label was. CPF's strategy is to inform end consumers and promote carbon-labeled products through local newspapers. Additionally, CPF will continue to release carbon-labeled products in order to familiarize end consumers with the carbon label. She mentions that it will take at least five years to create awareness among end consumers.

Recently, there was a survey of UK consumer awareness of fair trade, which is noted on certain products by the famous social label. The survey showed that consumer awareness has taken off over the last decade. In 2002, only 20% of the general public claimed recogni-

tion of fair trade labels. However, by 2008, that figure had grown to 70%, with 64% of the population showing an understanding of the concept behind the mark, and linking it to greater fairness for producers in the developing world. During the same time period, the fair trade market in the UK has grown from 63 to 712 million pounds, with sales of fair trade coffee representing more than 20% of the total UK market in 2008 (cf. Wales et al., 2010). This survey shows that creating awareness among consumers requires a long period of time.

To summarize, Thai consumer awareness of PWFL products is low due to the fact that such products currently do not exist in the market and Thai awareness of eco-labeled is still vague. As a consequence, consumer education and public promotion, such as advertising, are necessary to improve the awareness of consumers and the general public on the environmental and social issues surrounding PWFL products. In the survey questionnaire respondents said that they never knew how much water was being used in manufacturing a product and they were unaware of the hidden link between food security and water scarcity. If only this very fact is disclosed, consumer awareness of PWFL will be created at least in well-educated consumer groups. Much time is needed to launch the PWFL and sell PWFL products domestically in Thailand. However, it might take less time to create consumer awareness in developed countries because they are basically familiar with eco-labeled products.

6.1.3 Challenges of Water Footprint Accounting

Currently, there are a few companies who have already conducted water footprint accounting for their products. This section demonstrates the practical challenges of managing water footprint accounting.

First and foremost, water footprint accounting requires a significant amount of data, which is highly sensitive to just a few input parameters. Many products are produced through complex supply chains involving numerous growers, processors, and packaging, spread across multiple continents. Consequently, one company cannot access all of the required data. This has been demonstrated and proven by results from pilot studies. Water footprints for products come mainly from the field, not from the factory. These results highlight the importance of including the full supply chain in water footprint accounting. It can be extremely difficult to map the supply chain to the field level, because certain ingredients are purchased from distributors or cooperatives that stockpile products from hundreds of farms. The analysis is further complicated because the location of water use or farming can change, meaning that the flow of materials is ever-changing. This challenge can be overcome by selecting representative farms and plants for water footprinting. While data needs are still substantial, this could help focus the analysis (cf. The Coca-Cola Company, 2010).

Second, for food and beverage products, whose ingredients are derived mainly from fields, most of the data required for analysis belongs to suppliers and may be considered confiden-

tial for competitive reasons or because of concerns about comparison within their industry. For instance, crop yields, which can have a significant impact on the magnitude of the water footprint, also have implications for supplier sales and pricing strategies. Specific information about internal processes at manufacturing plants may also be deemed proprietary. Companies with a comprehensive operational water use management program in place may be able to focus their efforts on encouraging more sustainable practices for key crops in the supply chain (cf. The Coca-Cola Company, 2010).

Third, another variable that can greatly affect water footprint accounting is the source of the blue water footprint required for crops. It is crucial to understand how water scarcity in a watershed varies throughout the year as well as its relationship to crop water needs or use. The blue water footprint is commonly presented as a single number (cf. The Coca-Cola Company, 2010), which is the case for the PWFL that presents a volume of blue water and its main source. This can disguise critical spatial and temporal considerations of blue water consumption. The variability of the blue water footprint is also uncertain when only an annual average is presented. Particularly for agricultural products or ingredients, water use can vary considerably over the course of a year, as can water availability. As a result, the value of the water footprint will increase greatly when footprint components are disaggregated by water source. Besides, in order to develop appropriate response strategies, it is necessary to understand whether the blue water is coming from and being discharged to a river, lake, aquifer, or multiple sources. It is also important to know the season of water use and availability (cf. The Coca-Cola Company, 2010).

Lastly, sensitivity analyses also indicated that changes in input data for the grey water footprint could have a significant effect on water footprint results. Data on fertilizer application, and leaching and runoff rates for growing operations were not generally available for the pilot studies, so simplified assumptions were made. Therefore, the grey water components relating to the runoff and infiltration of pesticides and fertilizers are highly uncertain. The selection of water quality standards for grey water footprint calculations related to operations can also have a significant impact on the results (cf. The Coca-Cola Company, 2010). Similarly, SABMiller (2010) found that the quantification of the grey water footprint is problematic as the methodology remains in its early stages of development, and access to robust data is difficult and requires considerable investment of time and resources.

These mentioned challenges are not easy to overcome. However, WFN addresses solutions for some of these challenges as follows. First, to deal with the lack of required data, WFN suggests that developing more detailed guidelines regarding what default data can be used when accurate local estimates are not available is necessary. In this context, it is relevant to initiate a database with default water footprint estimates for a large variety of processes and products, differentiating between production regions such as countries (cf. Hoekstra et al., 2011). TCCC (2010) suggests that if it is not possible to acquire site-specific data, regional averages from global datasets may be the only available source of information. For example,

in the absence of data for the citrus-growing region of Brazil, data was obtained from readily available datasets. This raises the question of whether all water footprints will look the same for similar agriculturally derived products when site-specific data is unavailable and inputs are drawn from the same global databases. Second, a practical issue is the scope of studies. What should be included and what can be excluded from the water footprint analysis? By applying a very broad scope of analysis when estimating the water footprint of a specific product, some ingredients will not contribute significantly to the overall water footprint of the product and further tracing of the supply chain does not yield additional value. WFN advices that a more practical experience with water footprint accounting for a variety of products is necessary to develop practical guidelines on what can be excluded from a product water footprint analysis (cf. Hoekstra et al., 2011). Third, confidentiality of information derived from field operations must be addressed. Some suppliers were willing to share information with the third party that conducted the water footprinting after a confidentiality agreement had been signed. Other suppliers expressed more willingness to work together through an industry association to develop a water footprint for a particular region. In either case, getting the needed data is time-consuming and may increase project costs. This factor can also limit the level of informational detail that can be shared (cf. The Coca-Cola Company, 2010). Last, development and standardization of the methodology for calculating the grey water footprint as well as clear guidelines for blue water footprint are needed.

In conclusion, these challenges have some degree of influence on the correctness of information of PWFL. Nonetheless, it is not necessary to overcome all these difficulties before the PWFL can be applied. It can start right now with support from current technologies and knowledge. The PWFL should be developed continuously rather than waiting until everything is perfect or until all data is available.

6.2 Summary

Recent market and consumer behavior studies show that consumers tend to buy more eco-products today than they did in the past because they are aware of environmental issues and would like to support eco-friendly producers in order to reduce negative effects on nature. The first relevant question of this research is **whether or not consumers will do the same thing in the context of water scarcity by choosing products with low water footprints over similar products that contain higher water footprints.** Findings gained from the survey questionnaire on product water footprint labeling in Thailand show that awareness of water scarcity is ambiguous or respondents feel that there are other more important issues than water scarcity. They are willing to buy a PWFL product, but only if its price is the same as conventional products, or at most, 10% above markup. Nevertheless, one cannot be sure that they will choose a low water footprint product over others at supermarkets. As a result, it can be concluded that product water footprint labeling cannot be initiated by depending on Thai consumer demand at this time. Further study needs to be done to determine whether there is consumer demand for PWFL in other countries or not. If there is no demand from domestic or foreign consumers, big exporting businesses could play an active role, using PWFL in educating consumers about water problems and linkages between food consumption patterns and water problems.

The second relevant research question concerns **the role of such stakeholders as farmers, exporting businesses, international retailers, international NGOs, governments of developing countries, and worldwide consumers in supporting PWFL.** Exporting businesses should not be the only ones who take responsibility for water resources and PWFL cannot be accomplished without sound global corporation among potential actors. Exporting businesses need to thoroughly understand the water footprint concept and must reduce the water footprints in their supply chains and collect water footprint data with farmers. After that, it is crucial to collect and assemble information about water footprints in order to generate water footprint accounting. Next, they could propose PWFL or even launch it themselves. Last, communicating with the public is necessary to promote PWFL products by creating a stakeholders' dialogue. International NGOs, such as WFN, have to provide know-how about water footprint accounting to exporting businesses. Funding farmers to implement water-friendly cultivation and providing financial incentives for exporting businesses interested in promoting the PWFL in the form of expert fees or certification costs are assigned as endeavors of the governments of developing countries. International retailers could help shoulder the cost of certification for exporting businesses and act as a bridge between them and consumers. Cooperation between international retailers and exporting businesses in either proposing or launching PWFL and in formulating sound promotion and marketing plans for the PWFL is preferable. Educating consumers requires cooperation among local governments, international NGOs, global retailers, and exporting businesses. Last but not least, consumers have an obligation to educate themselves about water scarcity and water pollution and to use their buying power to force businesses to improve their production processes.

Since PWFL does not currently exist, there are no empirical sustainable effects on water resources derived from the program to report. Yet such effects can be predicted based on sustainable effects resulting from other labeling schemes.

The third research relevant question is **how businesses in the food and beverage sector can benefit from transparency in water use in the production processes by launching PWFL products***.* First, companies are able to identify and prioritize significant water use to reduce wastewater, both within their own operations and throughout the whole supply chain. This in turn might reduce water consumption and increase operational efficiency, leading to cost savings for companies. In some cases, companies also gain a price premium for PWFL products. Second, better decision making on defining potential opportunities to address poor wastewater treatment and associated water quality problems can be made. Third, the PWFL can be an effective communication tool, not only for raising consumer awareness of water issues, but also for communicating expectations and requirements about sustainable management of water resources to interested parties. Fourth, intangible benefits, including building brand equity and protecting a company's license to operate could be obtained from this labeling. Last but not least, exporting companies in developing countries may also use the PWFL to promote their exported products in the global market.

To answer the main research question of **how product water footprint labeling can induce sustainable use of water resources in the food and beverage sector**, the labeling scheme should be summarized as follows. Product water footprint labeling aims to furnish consumers with the information necessary to make a sustainable purchasing decision, initiate a dialogue in relation to competitors, policymakers, and consumers, and drive the market toward the requirements and goals of PWFL. These include sustainable use of freshwater in the food and beverage sector. If consumers have this information, they are better informed to choose products with a lower negative impact on the environment. All this in turn would force companies to find ways to use less water in their production chains, in order to obtain a PWFL. This would lead to an increase in freshwater for ecological uses and a decrease in contaminated water. In addition to altering consumer behavior, PWFL might compel manufacturers to be more water-concerned, as in the case of the dolphin-tuna controversy and eco-labels. Once a critical mass of businesses has applied successfully for an eco-label within a certain market segment, the remaining companies find themselves under considerable market pressure. Another important possible and expected positive effect on society derived from PWFL includes improvement of human health and welfare through food security. It also has the potential to reduce conflicts about water resources between and within countries, especially those in the Near East.

6.3 Outlook

Water problems cannot be solved by national or regional action plans alone. They require international or global action plans. If actions are not taken now to manage water demand, the future security of the water supply will not be stable. Water efficiency and conservation are essential to securing our future supply, and simple technological and behavioral changes can save significant volumes of water (the Environmental Audit Committee, 2009). Historically, profits have driven the direction of companies. However, stewardship among stakeholders involves much more than the bottom line. It is the time for businesses to waive short-term gains and concentrate on long-term value, not only for themselves but also for their communities and for the planet. There is no doubt that the cooperation of businesses plays a central role in solving the world's water problems since the business sector is the most powerful mechanism for creating a functioning society and matching needs with goods and services (cf. Esty & Winston, 2006). Companies can be a leading group in forcing society to care for the environment, protect shared natural assets, and prove that financial and environmental success can be accomplished together.

Product water footprint labeling will help inform consumer choice and engage people in tackling water scarcity. However, taken alone, labeling is unlikely to be a sufficient force for driving transformational shifts in consumer behavior and it should not be viewed in isolation. Rather it should be complimented by a more holistic approach, coupled with proactive action from companies and governments to guide consumer behavior (cf. the Environmental Audit Committee, 2009; Wales et al., 2010). Finally, advantages from water-saving production processes, stimulated by a marketing tool like the PWFL, will trigger other companies in the food and beverage sector to be more conscious of water resources. Consequently, it will ultimately inspire people to build companies and create industries that are not just innovative and powerful, but caring about the world's future too (cf. Esty & Winston, 2006).

If ecological requirements are not respected, the environment that sustains life will erode (UNDP, 2006). It is significant to acknowledge that PWFL is not and will not be the only solution to the problem of unsustainable water consumption, but rather it will be one tool in a toolbox of sustainable water use options.

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ANNEX

Annex 1: Survey Questionnaire

1.1 Structure and Goals of Survey Questionnaire

Structure and goal of survey questionnaire				
TOPIC	GOAL	No.	QUESTION	TYPE OF ANSWER
1. Questions from video				
	Format of the Water Footprint label	1.1-1.2	Which format do you prefer to use as the Water Footprint label?	Multiple choice and qualitative reason
	Willingness to pay for Water Footprint labelled products	1.3	How much do you want to pay for 10 Water Footprint labelled eggs? (if 10 conventional eggs cost 30 Baht)	Multiple choice
		1.4	How much do you want to pay for Water Footprint labelled 1 liter milk? (if conventional 1 liter milk costs 40 Baht)	Multiple choice
		1.5	How much do you want to pay for Water Footprint labelled 5 kg rice? (if conventional 5 kg rice cost 150 Baht)	Multiple choice
		1.6	How much do you want to pay for Water Footprint labelled 1 kg chicken meat? (if conventional 1 kg chicken meat costs 90 Baht)	Multiple choice
2. Water				
	Awareness of water scarcity	2.1-2.2	"Water is a finite resource", do you agree with that?	Y/N/No comment
	Links between food and water	2.3	Please assess the extent, agriculture contributes to the global use of water (in percent).	Multiple choice
		2.4-2.5	"No water = No food" do you agree with that?	Y/N/No comment
	Awareness of problems of water in Thailand	2.6	Please address your opinion, how important Thailand's water problems is.	Scale
	Impacts of water problems	2.7	Does the problem/do problems from Q 2.6 have effect on your personal life?	Scale
	Causes of water problems	2.8	Please assess, how much the following causes contribute to water problems in Thailand.	Scale
			- Global warming that causes droughts, unseasonal rain, and floods	
			- Population growth that increases demand for water (drink water and for daily life: sanitation etc.)	
			- Trend of water hungry lifestyles (too often car washing, bath, etc.)	
			- Agriculture uses water inefficiently or carelessly	
			- Industries release waste water without (proper) treatment	
			- Lack of efficient water management policy from the government	
	Role of respondent to water problems	2.9	How important is it in your opinion, to solve water problems in Thailand?	Scale
		2.10	Please assess, to what extent that following persons/institutions are "responsible" for water problems.	Scale
			- Farmers/producers	
			- Business/Industry	
			- politicians/government	
			- NGOs	
			- Consumers	
		2.11	Please assess, to what extent that following persons/institutions should participate in "solving" water problems.	Scale
			- Farmers/producers	
			- Business/Industry	
			- politicians/government	
			- NGOs	
			- Consumers	

3. Product Water Footprint Label				
	The water footprint of a product is			
	Examples of global average water			
	1) 3,900 litres of water for 1 kg of			
	2) 2,500 litres of water for 1 kg of			
	3) 140 litres of water for 1 cup of			
	4) 200 litres of water for one egg			
	5) 1,000 litres of water for 1 litre of			
	6) 4,800 litres of water for 1 kg of			
	7) 3,400 litres for 1 kg of rice			
	8) 30 litres of water for 1 cup of tea (250 ml)			
	(Source: http://www.waterfootprint.org/?page=files/productgallery)			
	The volume of freshwater used to produce the product will be identified on "Water Footprint Label", which will be issued			
	At this moment, there is "no" Water Footprint Label on the market. As a result, following questions aim to study about			
	Awareness on Eco-labels	3.1	Are you generally interested in Eco-label on a product?	Scale
		3.2	Does an Eco-label have an influence on your purchase decision?	Scale
	Perception of the Product Water Footprint Label according to information provided above	3.3	A Water Footprint labelled product shows that the producer has already improved/adapted/developed its production process to use less water.	Y/N/No comment
		3.4	A Water Footprint labelled product shows that the producer has the social responsibility by using less water in its production process.	Y/N/No comment
		3.5	Do you think that the quality of a Water Footprint labelled product is better than non-labelled products in the same range?	Scale
	Trustworthy of the label	3.6	Is a Water Footprint label trustworthy, if it is put forward and is controlled by the third party?	
			- Yes, definitely	
			- Yes, to some extent	Multiple choice
			- No, hardly	
			- No, absolutely not	
			- I don't know	
		3.7	Is a Water Footprint label trustworthy, if it is put forward and is controlled by the producer without third party's participation?	
			- Yes, definitely	
			- Yes, to some extent	Multiple choice
			- No, hardly	
			- No, absolutely not	
			- I don't know	
4. The role of consumer in supporting the product water footprint labelling				
	General purchasing behavior	4.1	Please assess how often do you buy food and beverage products from the following options.	
			- Grocery store	
			- Convenient store e.g. 7-Eleven	
			- Supermarket e.g. Tops, Foodland, Gourmet Market, Villa Market	Scale
			- Discount store e.g. Lotus, Big C, Carrefour	
			- Wholesale e.g. Makro	
			- Farmers/producers	
		4.2	How often do you buy products with environmental labels (green label, carbon label etc.)?	Scale
		4.3	Please assess how often do you buy Eco-labelled food and beverage products from the following options.	
			- Grocery store	
			- Convenient store e.g. 7-Eleven	
			- Supermarket e.g. Tops, Foodland, Gourmet Market, Villa Market	Scale
			- Discount store e.g. Lotus, Big C, Carrefour	
			- Wholesale e.g. Makro	
			- Farmers/producers	
	Influence on producers	4.4	Do you as a consumer can influence producers to make them display the water footprint of their products?	
			- Yes, definitely	
			- Yes, to some extent	Multiple choice
			- No, hardly	
			- No, absolutely not	
			- I don't know	
	Role of consumer	4.5	Do you agree? By purchasing water footprint labelled products you (as a consumer) can contribute to reduce water problems, because producers improve their production processes in order to use less water.	Y/N/No comment
		4.6	Would you recommend your friends to buy water footprint labelled food and beverage products?	Y/N/No comment

5. General information of respondent				
		5.1	Age of respondent (years)	Multiple choice
		5.2	Gender of respondent	Multiple choice
		5.3	Family status of respondent	Multiple choice
		5.4	Education status of respondent	Multiple choice
		5.5	Occupation of respondent	Multiple choice
		5.6	Location of respondent	Free text
		5.7	Income of respondent pro month (Baht)	Multiple choice
Comment/suggestion				

1.2 Paper-based Survey Questionnaire (Thai)

แบบสอบถาม เรื่อง พฤติกรรมผู้บริโภค เกี่ยวกับ "ฉลาก Water Footprint บนสินค้าอาหารและเครื่องดื่ม"

แบบสอบถามนี้เป็นส่วนหนึ่งของงานวิจัย เรื่อง "การใช้ทรัพยากรน้ำอย่างยั่งยืนในอุตสาหกรรมอาหารและเครื่องดื่ม โดยใช้ฉลาก Water Footprint บนสินค้าอาหารและเครื่องดื่มเป็นเครื่องมือผลักดัน (Sustainable use of water in the food and beverage sector through Product Water Footprint Labelling)" ในหลักสูตรปริญญาโทด้านการบริหารจัดการธุรกิจเพื่อการพัฒนาอย่างยั่งยืน (MBA for Sustainability Management) มหาวิทยาลัยลอยพานา เมืองลือเนบวร์ก ประเทศเยอรมนี (Leuphana Universität Lüneburg, Germany) แบบสอบถามนี้ต้องการสำรวจความเป็นไปได้ของการใช้ "ฉลาก Water Footprint บนสินค้าอาหารและเครื่องดื่ม" อันจะนำไปสู่การใช้ทรัพยากรน้ำอย่างยั่งยืน โดยการใช้เครื่องมือทางการตลาดเป็นแรงจูงใจและผลักดันให้ภาคธุรกิจหันมาใส่ใจการผลิตสินค้าโดยใช้ทรัพยากรน้ำอย่างประหยัดและมีประสิทธิภาพ

กรุณาอ่านข้อมูลเบื้องต้นของฉลาก Water footprint และตอบทุกคำถามในแบบสอบถาม ขอรับรองว่าการตอบแบบสอบถามของท่านจะไม่ระบุถึงตัวบุคคล ข้อมูลทั้งหมดจะถูกเก็บเป็นความลับ และจะถูกใช้เพื่อจุดประสงค์การวิจัยทางวิชาการเท่านั้น ขอแสดงความนับถือ กุลวัลย์ สุพีสุนทร E-mail: phaiysk@yahoo.com Blog: http://www.bloggang.com/mainblog.php?id=waterfootprintlabel

"Water footprint (WF: รอยเท้าน้ำ)" คือ ปริมาณน้ำที่ใช้ในการผลิตสินค้าต่อหน่วย (กิโลกรัม/ลิตร/ชิ้น)
ยกตัวอย่างเช่น
1. เนื้อไก่ 1 กก. ใช้น้ำในการผลิต 3,900 ลิตร
2. มะพร้าว 1 กก. ใช้น้ำในการผลิต 2,500 ลิตร
3. กาแฟ 1 ถ้วย (125 มิลลิลิตร) ใช้น้ำในการผลิต 140 ลิตร
4. ไข่ 1 ฟอง ใช้น้ำในการผลิต 200 ลิตร
5. นม 1 ลิตร ใช้น้ำในการผลิต 1,000 ลิตร
6. เนื้อหมู 1 กก. ใช้น้ำในการผลิต 4,800 ลิตร
7. ข้าว 1 กก. ใช้น้ำในการผลิต 3,400 ลิตร
8. ชา 1 ถ้วย (250 มิลลิลิตร) ใช้น้ำในการผลิต 30 ลิตร
(ที่มา: http://www.waterfootprint.org/?page=files/productgallery)

"ฉลาก Water Footprint บนสินค้าอาหารและเครื่องดื่ม" ทำหน้าที่ "ระบุปริมาณน้ำที่ใช้ในการผลิต" สินค้านั้นๆ ซึ่งจะออกให้แก่ผู้ผลิตที่ใช้น้ำในการผลิต "ต่ำ" กว่าค่าเฉลี่ยการใช้น้ำในการผลิตของสินค้านั้นๆ จากฐานข้อมูลของ Water Footprint Network ณ ปัจจุบัน ยัง "ไม่มี" ฉลาก Water Footprint บนสินค้าอาหารและเครื่องดื่ม ดังนั้น ผู้วิจัยจึงต้องการศึกษาแนวโน้มและการสนองตอบของผู้บริโภค หากมีสินค้าอาหารและเครื่องดื่มที่ติดฉลาก Water Footprint ซึ่งระบุถึงปริมาณน้ำที่ใช้ในการผลิตออกจำหน่ายในท้องตลาด

!"#รูปแบบฉลาก $%&(#)&(,-&และราคาของสินค้าที่ผู้บริโภคต้องการซื้อ!**

!

"#!ท่านเห็นว่ารูปแบบฉลาก $%&(!)**&(,-&บนผลิตภัณฑ์อาหารและเครื่องดื่มควรเป็นแบบใด!

- แบบ . !แสดงถึงปริมาณน้ำที่ใช้ในการผลิตสินค้า และค่าเฉลี่ยการใช้น้ำของอุตสาหกรรมที่ผลิตสินค้านั้น บนรูปหยดน้ำ!

! !

- แบบ / !แสดงถึงปริมาณน้ำที่ใช้ในการผลิตสินค้า และค่าเฉลี่ยการใช้น้ำของอุตสาหกรรมที่ผลิตสินค้านั้น บนรูปรอยเท้าน้ำ!

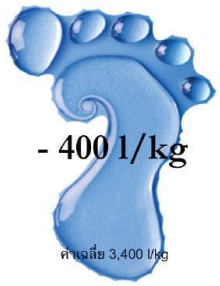
! !

- แบบ O!แสดงถึงปริมาณน้ำที่ใช้ลดลงจากค่าเฉลี่ยการใช้น้ำของอุตสาหกรรมที่ผลิตสินค้านั้น และค่าเฉลี่ยการใช้น้ำของอุตสาหกรรม บนรูปหยดน้ำ !

! !

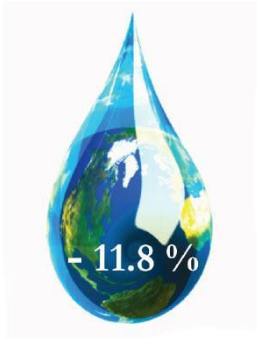
!

- แบบ ! "แสดงถึงปริมาณน้ำที่ใช้ลดลงจากค่าเฉลี่ยการใช้น้ำของอุตสาหกรรมที่ผลิตสินค้านั้น และค่าเฉลี่ยการใช้น้ำของอุตสาหกรรม บนรูปรอยเท้าน้ำ" "



" "

- แบบ #"แสดงถึงร้อยละของปริมาณน้ำที่ใช้ลดลงจากค่าเฉลี่ยการใช้น้ำของอุตสาหกรรมที่ผลิตสินค้านั้น บนรูปหยดน้ำ" "



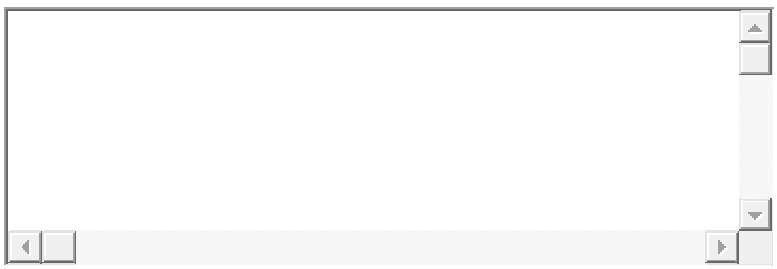
" "

- แบบ $"แสดงถึงร้อยละของปริมาณน้ำที่ใช้ลดลงจากค่าเฉลี่ยการใช้น้ำของอุตสาหกรรมที่ผลิตสินค้านั้น บนรูปรอยเท้าน้ำ"

" "

- "ไม่มีความเห็น"

%&"กรุณาให้เหตุผลประกอบคำตอบของท่านในข้อ %&0



"

"

!''#$ากปกติ ไข่ไก่ !'%$อง มีราคา #'%$าท$ท่านจะซื้อไข่ไก่ !'%$อง ที่ติดฉลาก &'()*$+,(-*/($ในราคาเท่าไร $

- $#'$$าท$
- $0$$าท$
- $1$$าท$
- $$ไม่มีความเห็น$
- $$อื่นๆ:$ $

!''2$ากปกติ นม !$ลิตร มีราคา 2'$าท ท่านจะซื้อนม !$ลิตร ที่ติดฉลาก &'()*$+,(-*/($ในราคาเท่าไร$

- $2$$าท$
- $3$$าท$
- $5$$าท$
- $$ไม่มีความเห็น$
- $$อื่นๆ:$ $

!''4$ากปกติ ข้าวสาร 4$โลกรัม มีราคา !4'%$าท ท่านจะซื้อข้าวสาร 4$โลกรัม ที่ติดฉลาก &'()*$+,(-*/(ในราคาเท่าไร $

- $04$$าท$
- $3'$$าท$
- $14$$าท$
- $$ไม่มีความเห็น$
- $$อื่นๆ:$ $

!''0$ากปกติ เนื้อไก่ !$โลกรัม มีราคา 1'$าท ท่านจะซื้อเนื้อไก่ !$โลกรัม ที่ติดฉลาก &'()*$+,(-*/($น $ราคาเท่าไร$

- $11$$าท$
- $'8$$าท$
- $!'6$$าท$
- $$ไม่มีความเห็น$
- $$อื่นๆ:$ $

!"#ทรัพยากรน้ำ#

!"#$ท่านเห็นด้วยกับคำกล่าวที่ว่า "น้ำเป็นทรัพยากรที่มีอยู่อย่างจำกัด" หรือไม่$

- $เห็นด้วย$
- $ไม่เห็นด้วย$
- $ไม่มีความเห็น$

!"!$รุณาให้เหตุผลประกอบคำตอบของท่านในข้อ !"#$

$

!"%$ท่านคิดว่าภาคการเกษตรใช้น้ำเป็นร้อยละเท่าใดของน้ำที่มีบนโลก$

- $อยกว่าร้อยละ !&$
- $อยละ !&$$อยละ (&$
- $อยละ (&$$อยละ)&$
- $อยละ)&$$อยละ *&$
- $ากกว่าร้อยละ *&$

!"($ท่านเห็นด้วยกับคำกล่าวที่ว่า "ขาดน้ำ = ขาดอาหาร" หรือไม่$

- $เห็นด้วย$
- $ไม่เห็นด้วย$
- $ไม่มีความเห็น$

!"+$รุณาให้เหตุผลประกอบคำตอบของท่านในข้อ !"($

$

$

!'"#$ท่านคิดว่าปัญหาทรัพยากรน้ำในประเทศไทยมีความสำคัญเพียงใด$

$	%$	!$	&$	'$	($	$
ไม่มีความสำคัญ$	○ ﹔	○ ﹔	○ ﹔	○ ﹔	○ ﹔	มีความสำคัญอย่างยิ่ง$

$

!')$ท่านคิดว่าปัญหาทรัพยากรน้ำในประเทศไทยมีผลกระทบต่อการดำเนินชีวิตประจำวันเพียงใด$

$	%$	!$	&$	'$	($	$
ไม่มีผลกระทบ$	○ ﹔	○ ﹔	○ ﹔	○ ﹔	○ ﹔	มีผลกระทบอย่างมาก$

$

!'*$ท่านคิดว่าปัจจัยดังต่อไปนี้ ก่อให้เกิดปัญหาด้านทรัพยากรน้ำในประเทศไทยเพียงใด$

$	$	ไม่มีความเกี่ยวข้อง$	เล็กน้อย$	ปานกลาง$	มาก$	มีความเกี่ยวข้องเป็นอย่างมาก$	$
ภาวะโลกร้อน (+,-./,$ 0/1234566$)ซึ่งก่อให้เกิดภาวะฝนแล้ง ฝนหลงฤดู น้ำท่วม$	$	○ $	○ $	○ $	○ $	○ $	$
ประชากรเพิ่มขึ้น ส่งผลให้มีความต้องการใช้น้ำเพื่ออุปโภคและบริโภคสูงขึ้น$	$	○ $	○ $	○ $	○ $	○ $	$
การเปลี่ยนแปลงการใช้น้ำในชีวิตประจำวันไปสู่แฟชั่นการใช้น้ำอย่างสิ้นเปลือง (7/801$;4514 ,39>8,9>6$)เช่น ล้างรถบ่อยเกินจำเป็น อาบน้ำในอ่างอาบน้ำ ฯลฯ$	$	○ $	○ $	○ $	○ $	○ $	$
ภาคการเกษตรใช้น้ำอย่างสิ้นเปลือง หรือไร้ประสิทธิภาพ$	$	○ $	○ $	○ $	○ $	○ $	$

!	!	ไม่มีความเกี่ยวข้อง!	เล็กน้อย!	ปานกลาง!	มาก!	มีความเกี่ยวข้องเป็นอย่างมาก!	!
ภาคอุตสาหกรรมปล่อยน้ำเสียลงสู่แหล่งน้ำ โดยปราศจากการบำบัดที่เหมาะสม!	!	!	!	!	!	!	!
ภาครัฐขาดนโยบายการจัดการทรัพยากรน้ำอย่างมีประสิทธิภาพ!	!	!	!	!	!	!	!

!

"#$ปัญหาด้านทรัพยากรน้ำในประเทศไทยมีความสำคัญที่จะต้องได้รับการแก้ไขเพียงใด!

!	%	"!	&	'!	(!	!
ไม่สำคัญอย่างยิ่ง!	!	!	!	!	!	สำคัญเป็นอย่างยิ่ง!

!

"#)บุคคลดังต่อไปนี้มีควรมีส่วน "รับผิดชอบ" ต่อปัญหาด้านทรัพยากรน้ำเพียงใด!

!	!	ไม่มีส่วนรับผิดชอบ!	เล็กน้อย!	ปานกลาง!	มาก!	มีส่วนรับผิดชอบอย่างมาก!	!
เกษตรกร!	!	!	!	!	!	!	!
ภาคธุรกิจและกลุ่มอุตสาหกรรมผลิตภัณฑ์ทางการเกษตร!	!	!	!	!	!	!	!
ภาครัฐ!	!	!	!	!	!	!	!
องค์กรไม่หวังผลกำไร (*+, -.!	!	!	!	!	!	!	!
ผู้บริโภค!	!	!	!	!	!	!	!

!"#$ุคคลดังต่อไปนี้ควรมีส่วนร่วมในการ "แก้ไข" ปัญหาด้านทรัพยากรน้ำที่เกิดขึ้นเพียงใด$

$	$	ไม่มีส่วนรับผิดชอบ$	เล็กน้อย$	ปานกลาง$	มาก$	มีส่วนรับผิดชอบอย่างมาก$	$
เกษตรกร$	$	$	$	$	$	$	$
ภาคธุรกิจและกลุ่มอุตสาหกรรมผลิตภัณฑ์ทางการเกษตร$	$	$	$	$	$	$	$
ภาครัฐ$	$	$	$	$	$	$	$
องค์กรไม่หวังผลกำไร (%&' ()$	$	$	$	$	$	$	$
ผู้บริโภค$	$	$	$	$	$	$	$

!

"#ฉลาก $%&(!) **&(,-&นสินค้าอาหารและเครื่องดื่ม!

!

*"#$ โดยทั่วไป ท่านให้ความสนใจกับข้อมูลในฉลากเพื่อการอนุรักษ์สิ่งแวดล้อม (+, - ./012)$นสินค้าเพียงใด$

$	#$	!$	*$	3$	4$	$
น้อยที่สุด$	$	$	$	$	$	มากที่สุด$

*"!$ลากเพื่อการอนุรักษ์สิ่งแวดล้อม (+, - ./012)$นสินค้ามีอิทธิพลต่อการตัดสินใจซื้อสินค้าของท่านเพียงใด$

$	#$	!$	*$	3$	4$	$
น้อยที่สุด$	$	$	$	$	$	มากที่สุด$

$

"$นค้าอาหารและเครื่องดื่มที่มีฉลาก 5062789--97:;$สดงให้เห็นว่าผู้ผลิตมีการปรับปรุง/ปรับเปลี่ยน/พัฒนากระบวนการผลิตให้ใช้น้ำลดลง$

- $ใช่$
- $ไม่ใช่$
- $ไม่มีความเห็น$

!"#$สินค้าอาหารและเครื่องดื่มที่มีฉลาก %&&()$++',)-. '$แสดงให้เห็นว่าผู้ผลิตมีความรับผิดชอบต่อสังคม โดยการใช้น้ำในการผลิตน้อยลง$

- $ใช่$
- $ไม่ใช่$
- $ไม่มีความเห็น$

!"/$ท่านเห็นว่า สินค้าที่มีฉลาก %&&()$++',)-. '$มีคุณภาพดีกว่าสินค้าที่ไม่มีฉลาก$

$	0$	1$	!$	#$	/$	$
ไม่เห็นด้วยอย่างยิ่ง$	○	○	○	○	○	เห็นด้วยอย่างยิ่ง$

$

!"2$ฉลาก %&&()$3+',)-. '$ความน่าเชื่อถือหรือไม่ หากบุคคลที่ !$เป็นผู้ดำเนินการและควบคุมบุคคลที่ !$ได้แก่ ภาครัฐ4$งค์กรอิสระ4$งค์กรที่ไม่มุ่งหวังผลกำไร หรือ ภาคการศึกษา$

- $าเชื่อถืออย่างยิ่ง$
- $าเชื่อถือในระดับหนึ่ง$
- $อนข้าง ไม่น่าเชื่อถือ$
- $ไม่น่าเชื่อถืออย่างยิ่ง$
- $ไม่มีความเห็น$

!"5$ฉลาก %&&()$3+',)-. '$ความน่าเชื่อถือหรือไม่ หากผู้ผลิตเป็นผู้ดำเนินการและควบคุม โดยปราศจากการเข้าร่วมของบุคคลที่ !บุคคลที่ !$ได้แก่ ภาครัฐ4$งค์กรอิสระ4$งค์กรที่ไม่มุ่งหวังผลกำไร หรือ ภาคการศึกษา$

- $าเชื่อถืออย่างยิ่ง$
- $าเชื่อถือในระดับหนึ่ง$
- $อนข้าง ไม่น่าเชื่อถือ$
- $ไม่น่าเชื่อถืออย่างยิ่ง$
- $ไม่มีความเห็น$

!"# ยทบาทของผู้บริโภคต่อการสนับสนุน "ฉลาก $%&(#)&(-& นสินค้าอาหารและเครื่องดื่ม"#**

!"#$ านซื้อสินค้าอาหารและเครื่องดื่มจากสถานที่ต่อไปนี้บ่อยเพียงใด$

$	$	ไม่เคย$	นานๆที$	บางครั้ง$	บ่อยครั้ง$	เป็นประจำ$	$
ร้านขายของชำ$	$	$	$	$	$	$	$
ร้านสะดวกซื้อ เช่น %&()*)+$	$	$	$	$	$	$	$
ซุปเปอร์มาร์เก็ต เช่น ท็อปส์,$ ฟู้ดแลนด์,$ ยูร์เมตต์ มาร์เก็ต,$ วิลล่า มาร์เก็ต$	$	$	$	$	$	$	$
ดิสเคาน์สโตร์ เช่น โลตัส บิ๊กซี คาร์ฟูร์$	$	$	$	$	$	$	$
ร้านค้าส่งขนาดใหญ่ เช่น แมคโคร$	$	$	$	$	$	$	$
ซื้อโดยตรงจากเกษตรกร$	$	$	$	$	$	$	$

$

!"-$ านซื้อสินค้าที่เป็นมิตรต่อสิ่งแวดล้อม (สินค้าที่ติดฉลากเขียว,$ ลากคาร์บอน ฯลฯ) บ่อยเพียงใด$

$	#$	-$	.$	!$	/$	$
ไม่เคย$	$	$	$	$	$	เป็นประจำ$

$

!".$ านซื้อสินค้าอาหารและเครื่องดื่มเพื่อการอนุรักษ์สิ่งแวดล้อม/เป็นมิตรต่อสิ่งแวดล้อมจากสถานที่ต่อไปนี้ ใดบ่อยเพียงใด$

$	$	ไม่เคย$	นานๆที$	บางครั้ง$	บ่อยครั้ง$	เป็นประจำ$	$
ร้านขายของชำ$	$	$	$	$	$	$	$
ร้านสะดวกซื้อ เช่น %&()*)+$	$	$	$	$	$	$	$
ซุปเปอร์มาร์เก็ต เช่น ท็อปส์,$ ฟู้ดแลนด์,$ ยูร์เมตต์ มาร์เก็ต,$ วิลล่า มาร์เก็ต$	$	$	$	$	$	$	$

	ไม่เคย!	นานๆที!	บางครั้ง!	บ่อยครั้ง!	เป็นประจำ!
ดิสเคาน์สโตร์ เช่น โลตัส บิ๊กซี คาร์ฟูร์!	!	!	!	!	!
ร้านค้าส่งขนาดใหญ่ เช่น แมคโคร!	!	!	!	!	!
ซื้อโดยตรงจากเกษตรกร!	!	!	!	!	!

!

"#!ในฐานะผู้บริโภค ท่านคิดว่าท่านสามารถมีอิทธิพลต่อภาคธุรกิจให้แสดงปริมาณน้ำที่ใช้ในการผลิตสินค้าของตน ผ่านฉลาก $%&(!)**&(,-&หรือไม่!

- !สามารถมีอิทธิพลอย่างแน่นอน!
- !สามารถมีอิทธิพลในระดับหนึ่ง!
- !ไม่น่าจะสามารถมีอิทธิพล!
- !ไม่สามารถมีอิทธิพลอย่างแน่นอน!
- !ไม่มีความเห็น!

"#!ท่านเห็นด้วยหรือไม่ ว่าการบริโภคสินค้าอาหารและเครื่องดื่มที่มีฉลาก $%&(!)**&(,-&ทำให้ท่าน(ในฐานะผู้บริโภค)มีส่วนร่วมในการช่วยลดปัญหาการใช้น้ำอย่างสิ้นเปลือง เพราะผู้ผลิตได้ทำการปรับปรุงกระบวนการผลิตของตนให้ใช้น้ำลดลง!

- !ใช่!
- !ไม่ใช่!
- !ไม่มีความเห็น!

"#!ท่านจะแนะนำให้ผู้อื่นบริโภคสินค้าอาหารและเครื่องดื่มที่มีฉลาก $%&(!)**&(,-&

- !ใช่!
- !ไม่ใช่!
- !ไม่มีความเห็น!

!"# ข้อมูลพื้นฐานของผู้ตอบแบบสอบถาม#

!"#$ อายุ (ปี)$

- $ น้อยกว่าหรือเท่ากับ %&$
- $ %'(&$
- $!''&$
- $!')&$
- $!'*&$
- $ มากกว่าหรือเท่ากับ)!$

!"%$ เพศ$

- $ หญิง$
- $ ชาย$

!"($ สถานภาพ$

- $ อาศัยอยู่กับบิดา/มารดา$
- $ อาศัยอยู่กับบุตร/ธิดา$
- $ อาศัยลำพัง$
- $ สมรสหรืออยู่ร่วมกัน ไม่มีบุตร/ธิดา$
- $ สมรสหรืออยู่ร่วมกัน มีบุตร/ธิดา$

!"&$ พื้นฐานการศึกษา$

- $ ประถมศึกษา$
- $ มัธยมศึกษา ตอนต้น$
- $ มัธยมศึกษา ตอนปลาย$
- $ ปวช./ปวส.$
- $ ปริญญาตรี$
- $ ปริญญาโท$
- $ ปริญญาเอก$
- $ อื่นๆ:$ _____ $

!''!#าชีพ#

- #นักเรียน/นักศึกษา#
- #ราราชการ/พนักงานรัฐวิสาหกิจ#
- #จ้าของกิจการ#
- #พนักงานบริษัท#
- #แม่บ้าน#
- #างงาน#
- #่นๆ:# #

!'$#งหวัดที่ท่านอยู่อาศัยในปัจจุบัน #

!'%#ายได้ต่อเดือน (บาท)#

- #อยกว่าหรือเท่ากับ &('' #
- #&('&#' ('' #
- #'('&#' ('' #
- #'('&#' ('' #
- #'('&#&'('' #
- #ากกว่าหรือเท่ากับ &'('& #

ความคิดเห็น/ข้อเสนอแนะเพิ่มเติม#

#

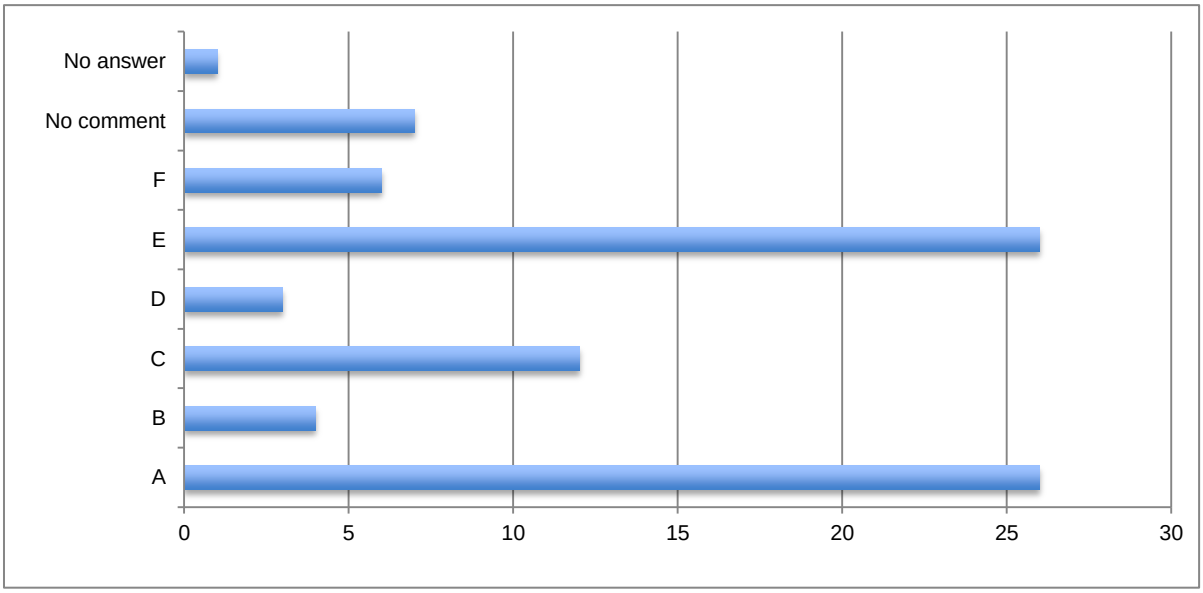
1.3 Survey Questionnaire Feedback (English)

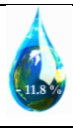
Internet-based Survey Questionnaire

85 Thai respondents participate in the internet-based survey questionnaire.

1. Questions from video

1.1 Which format do you prefer to use as the Water Footprint label?



	A	B	C	D	E	F	No comment	No answer
Label								
Description	See more detail in the introduction part of the research.							
Amount	26	4	12	3	26	6	7	1
Percent	31%	5%	14%	4%	31%	7%	8%	31%

1.2 Why?

<u>The water drop with the earth</u>

- It is nice, polite and easy to understand
- The water drop with the earth is better than the footprint in two aspects: communicating information about water footprint and creating awareness.
- The earth in a water drop makes consumers feel that they do it for the earth and the environment (save water for save world).
- It is impolite to put the footprint on food packages though it is more beautiful than the water drop with the earth.
- The footprint has a negative meaning.

<u>The footprint</u>

- The footprint delivers the meaning of the water footprint concept, yet not so attractive as the water drop with the earth.

- Nice picture and easy to understand
- The footprint as a logo might be compatible with the Carbon footprint in the future

3,000 l/kg with average 3,400 l/kg

- Easy to understand
- Comparison between actual water footprints and average water footprints makes it's easy for consumers to understand and see the difference.
- Actual water footprints inform consumers how much water is needed to produce one unit of a product.
- The percentage should be added on the logo without minus signal.
- Huge gap between actual and average water footprints shows that producers care for water resources more than other competitors.
- Consumers have a chance to make purchase decision by depending on water used in production processes, so that they can be apart of more effective water use by producers.
- Average amount of water footprint gives a clear picture more than percentage of reduction of water footprints.
- Reduction amount of water footprints could lead to misunderstanding of the meaning.

- 400 l/kg with average 3,400 l/kg

- It is easy to understand at a glance how much water is saved without calculation.
- The percentage should be added on the logo as well.
- Reduced percentage of water footprints could lead to misunderstanding of the meaning.
- Minus signal on the logo could lead to the negative perception of a product.
- Displaying reduction of water footprints allows customers to be able to compare water footprints of milk with water footprints of an egg because sometimes it is difficult to create a benchmark of some products.

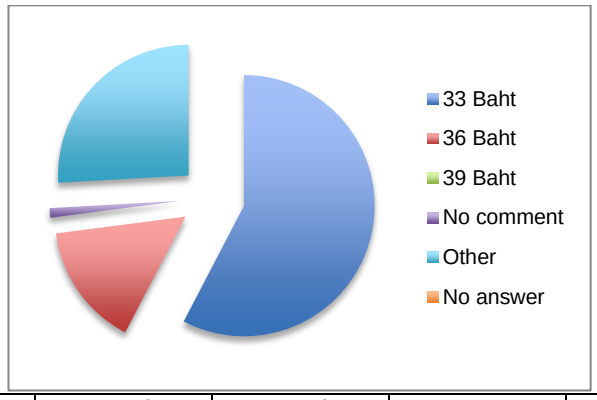
-11.8%

- Percentage shows how much water is saved and allows consumers to compare with other products in terms of kind and content.
- Percentage provides a clear picture of water saving.
- Average should be added as well.
- Easy to compare at a glance

No comment

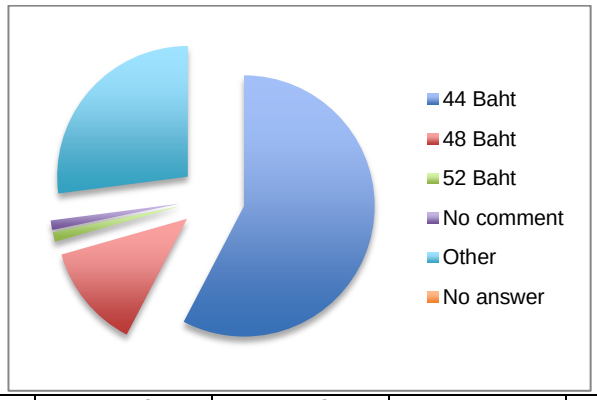
- Honestly, I don't agree with this subject.
- Logo should be reviewed because all of them cannot delivery clear information about the water footprint concept to end consumers. Nonetheless, I prefer reduced percentage because it is easy to understand.

1.3 How much do you want to pay for 10 Water Footprint labeled eggs? (If 10 conventional eggs cost 30 Baht)



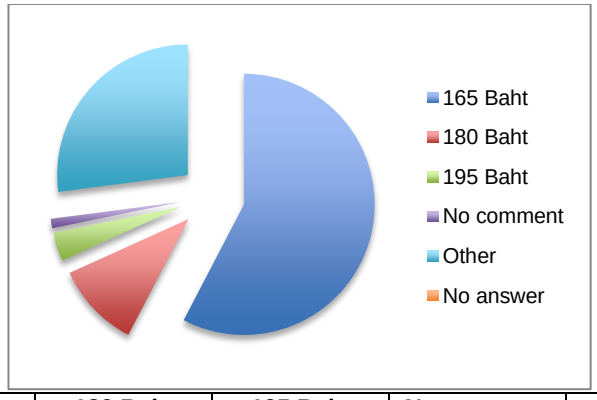
	33 Baht	36 Baht	39 Baht	No comment	Other	No answer
Amount	49	13	0	1	22	0
Percent	58%	15%	0%	1%	26%	0%

1.4 How much do you want to pay for Water Footprint labeled 1 liter of milk? (If conventional 1 liter of milk costs 40 Baht)



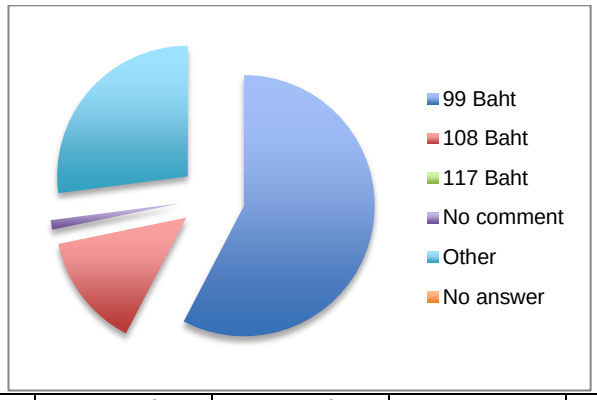
	44 Baht	48 Baht	52 Baht	No comment	Other	No answer
Amount	49	11	1	1	23	0
Percent	58%	13%	1%	1%	27%	0%

1.5 How much do you want to pay for Water Footprint labeled 5 kg rice? (If conventional 5 kg rice cost 150 Baht)



	165 Baht	180 Baht	195 Baht	No comment	Other	No answer
Amount	49	9	3	1	23	0
Percent	58%	11%	4%	1%	27%	0%

1.6 How much do you want to pay for Water Footprint labeled 1 kg chicken meat? (If conventional 1 kg chicken meat costs 90 Baht)



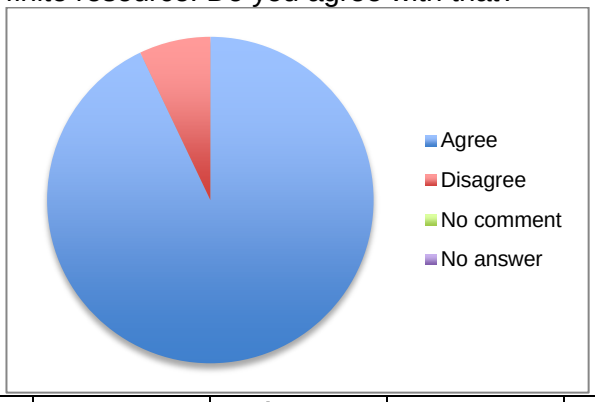
	99 Baht	108 Baht	117 Baht	No comment	Other	No answer
Amount	49	12	0	1	23	0
Percent	58%	14%	0%	1%	27%	0%

Other (for questions 1.3 – 1.6)

- The same price
- If the water footprint label increases prices, I don't think that Thais are going to buy them.
- I won't buy it.
- Mark up price should be 5% not 10%.
- How could we prove that producers really reduced their water use in production processes?
- The price should depend on water saving.
- I have no idea about the cost of production.
- The same price as usual but the government should offer producers some incentives.
- The price should be decreased because costs of water use are reduced as a result of water saving in production processes.

2. Water

2.1 Water is a finite resource. Do you agree with that?



	Agree	Disagree	No comment	No answer
Amount	79	6	0	0
Percent	93%	7%	0%	0%

2.2 Why?

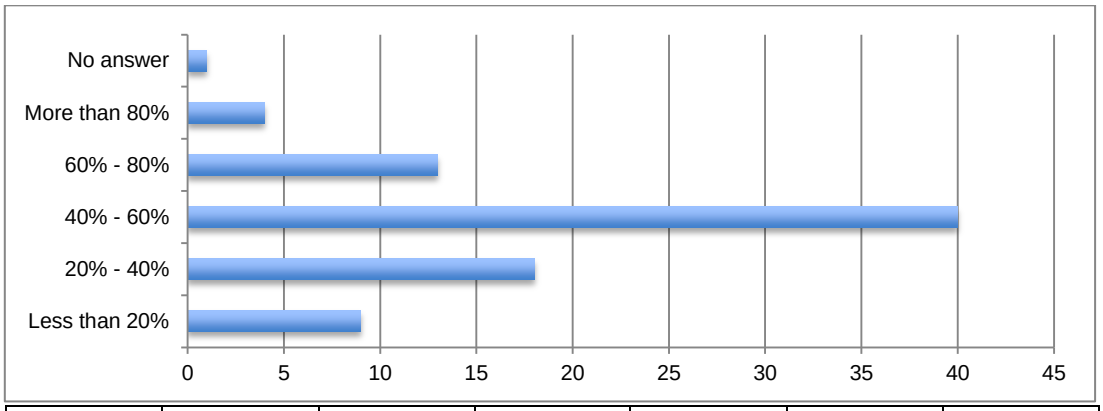
Agree

- Awareness about water scarcity is necessary.
- Population growth and water consumption are not compatible with water resources.
- Global warming causes water scarcities.
- Some factors in the environment are disturbed and as a consequence other resources such as water are affected.
- Freshwater is limited.
- Insufficient forests lead to water scarcities.
- Water scarcities depend heavily on geography.
- We have a lot of rain per year but we have poor water management plans as well.
- We must have our owned water management plan in case that water is suddenly unavailable.
- Water is a basic element of every life.
- Clean water is limited.
- Thailand faces water scarcity only in dry season and it impacts tremendously on exported agriculture products.
- Accesses to water resources are limited.

Disagree

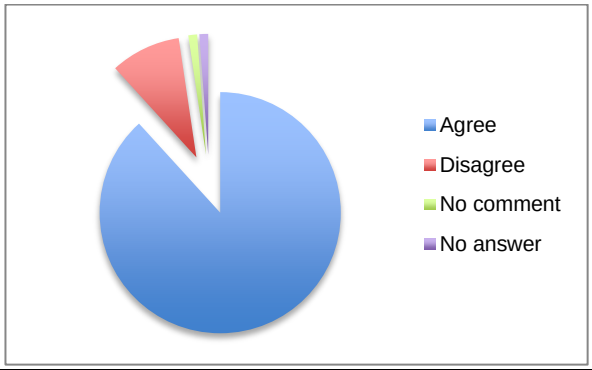
- Actually, there is a plenty of water on this planet and the report of the UN also insisted that there is enough water for everyone. Water scarcities are in fact because of poor water governances, corruptions, lack of human resources and budget in order to manage it properly.
- Water is still on this planet. It just changes its form into other forms.
- Water can be reused and recycled not like oil.

2.3 Please assess the extent, agriculture contributes to the global use of water (in percent).



	Less than 20%	20% - 40%	40% - 60%	60% - 80%	More than 80%	No answer
Amount	9	18	40	13	4	1
Percent	11%	21%	47%	15%	5%	1%

2.4 "No water = No food" do you agree with that?



	Agree	Disagree	No comment	No answer
Amount	75	8	1	1
Percent	88%	9%	1%	1%

2.5 Why?

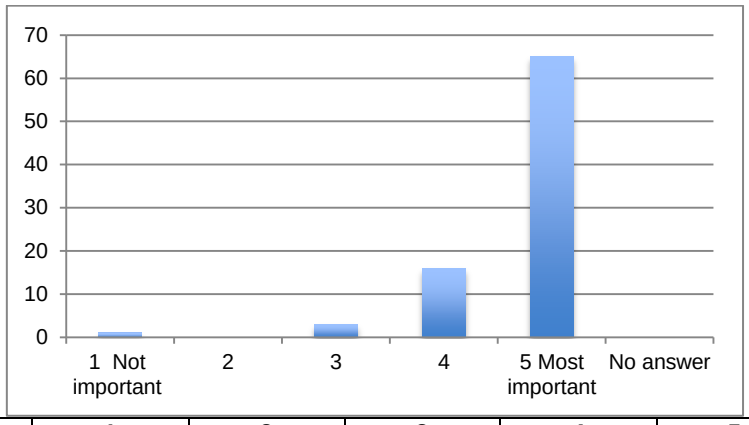
Agree

- Water is the main factor of agriculture.
- Without water there will be no plant and food for both animals and human being.
- Agriculture sector needs water as well as food industry sector.
- We cannot live without water.
- Without water can lead to no food, no clothes, no shelters, no electricity, no fuel, etc.

Disagree

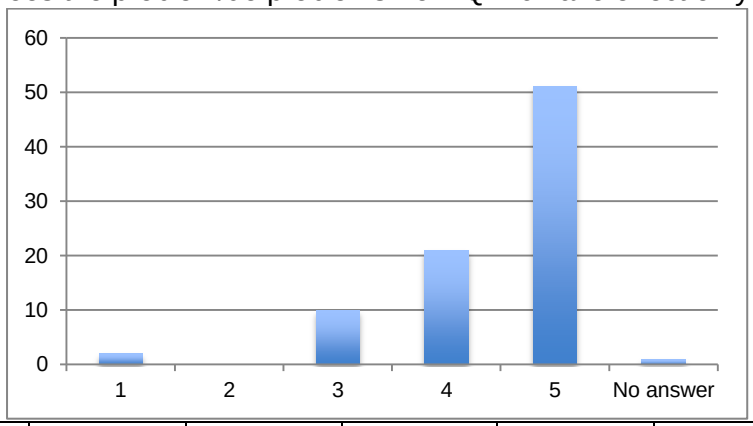
- Water is more important than food.
- We can live 2-3 days without water but we can live for a week without food.
- No water = no life

2.6 Please address your opinion, how important Thailand's water problems is.



	1 Not im-portant	2	3	4	5 Most im-portant	No answer
Amount	1	0	3	16	65	0
Percent	1%	0%	4%	19%	76%	0%

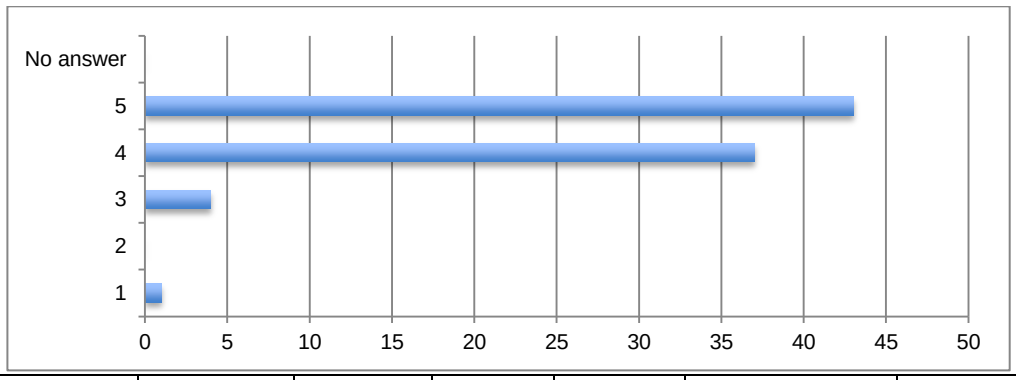
2.7 Does the problem/do problems from Q 2.6 have effect on your personal life?



	1 No impact	2	3	4	5 Big impact	No answer
Amount	2	0	10	21	51	1
Percent	2%	0%	12%	25%	60%	1%

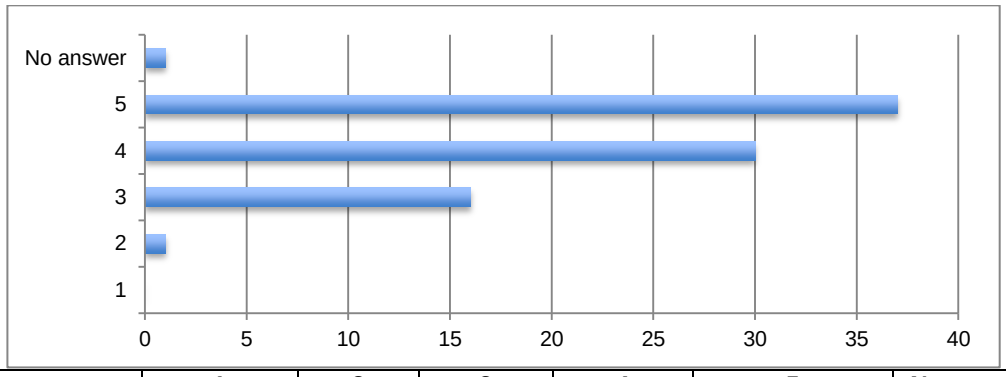
2.8 Please assess, how much the following causes contribute to water problems in Thailand.

- Global warming that causes droughts, unseasonal rain, and floods



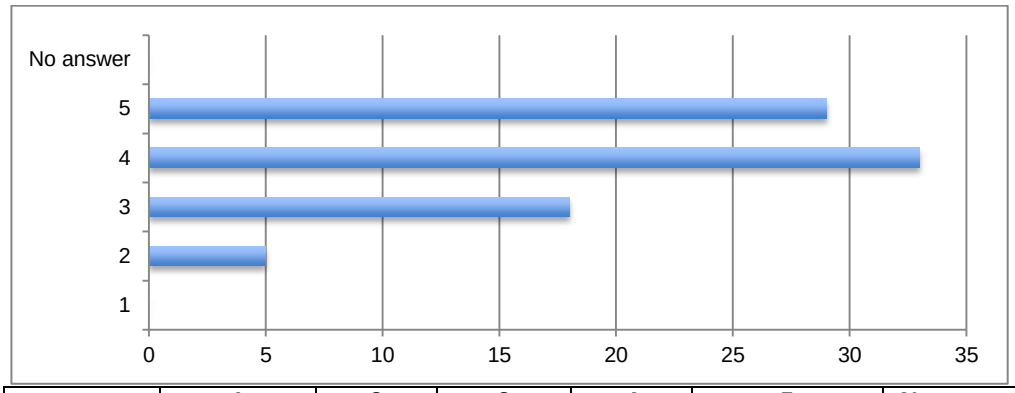
	1 Irrelevant	2	3	4	5 Most relevant	No answer
Amount	1	0	4	37	43	0
Percent	1%	0%	5%	44%	51%	0%

- Population growth that increases demand for water (drink water and for daily life: sanitation etc.)



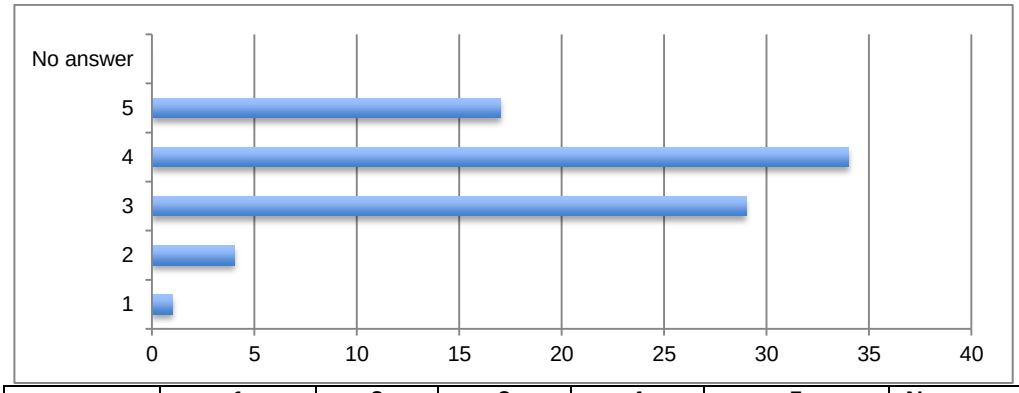
	1 Irrelevant	2	3	4	5 Most relevant	No answer
Amount	0	1	16	30	37	1
Percent	0%	1%	19%	35%	44%	1%

- Trend of water hungry lifestyles (too often car washing, bath, etc.)



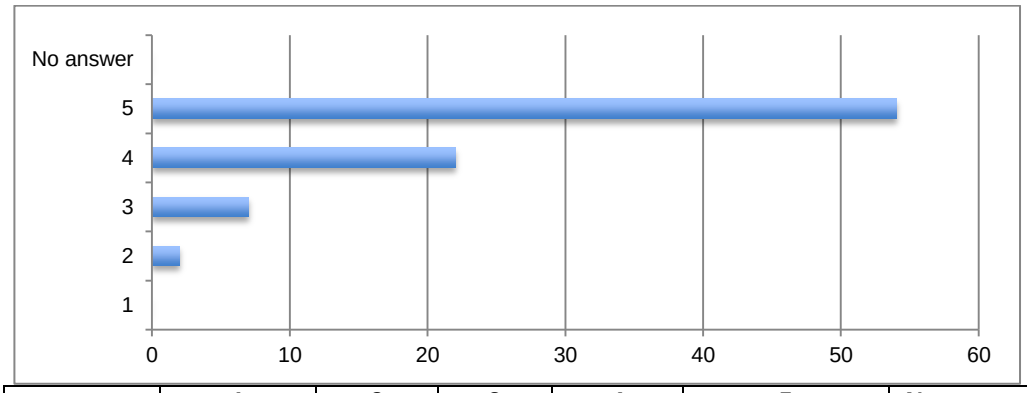
	1 Irrelevant	2	3	4	5 Most relevant	No answer
Amount	0	5	18	33	29	0
Percent	0%	6%	21%	39%	34%	0%

- Agriculture uses water inefficiently or carelessly



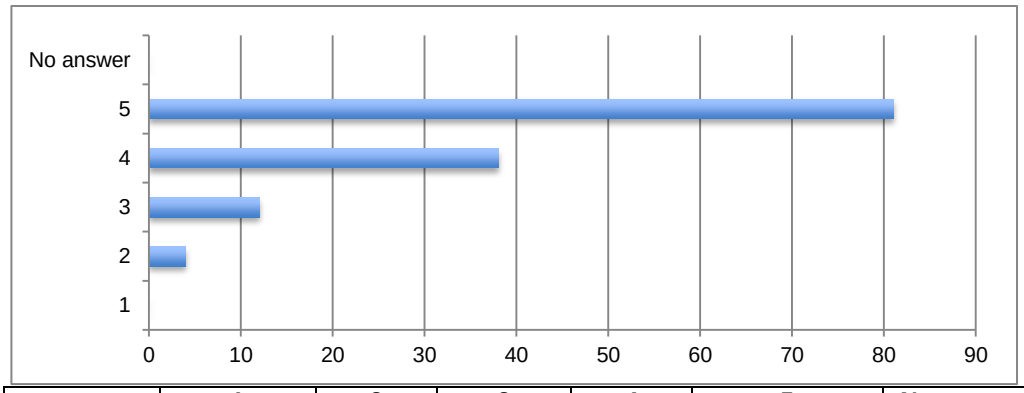
	1 Irrelevant	2	3	4	5 Most relevant	No answer
Amount	1	4	29	34	17	0
Percent	1%	5%	34%	40%	20%	0%

- Industries release waste water without (proper) treatment



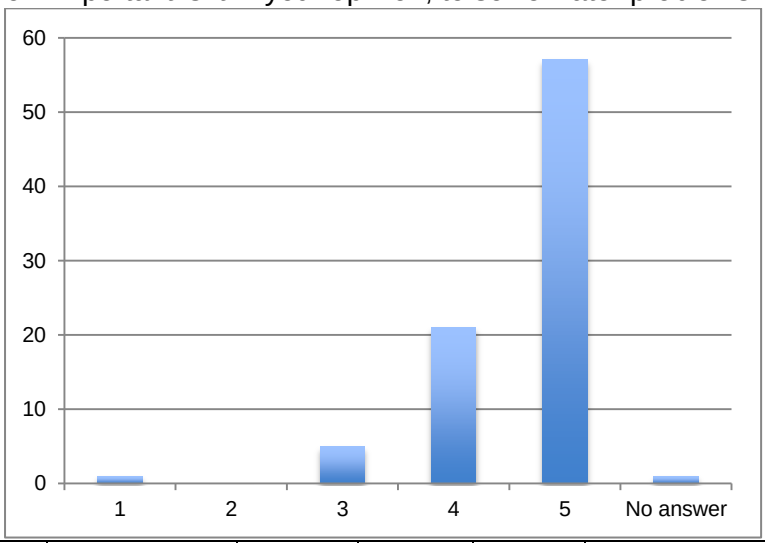
	1 Irrelevant	2	3	4	5 Most relevant	No answer
Amount	0	2	7	22	54	0
Percent	0%	2%	8%	26%	64%	0%

- Lack of efficient water management policy from the government



	1 Irrelevant	2	3	4	5 Most relevant	No answer
Amount	0	1	8	25	51	0
Percent	0%	2%	8%	26%	64%	0%

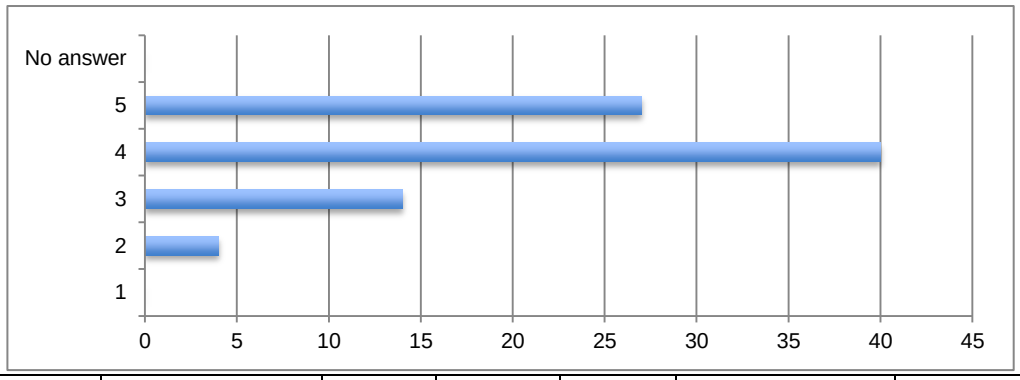
2.9 How important is it in your opinion, to solve water problems in Thailand?



	1 Not important	2	3	4	5 Most important	No answer
Amount	1	0	5	21	57	1
Percent	1%	0%	6%	25%	67%	1%

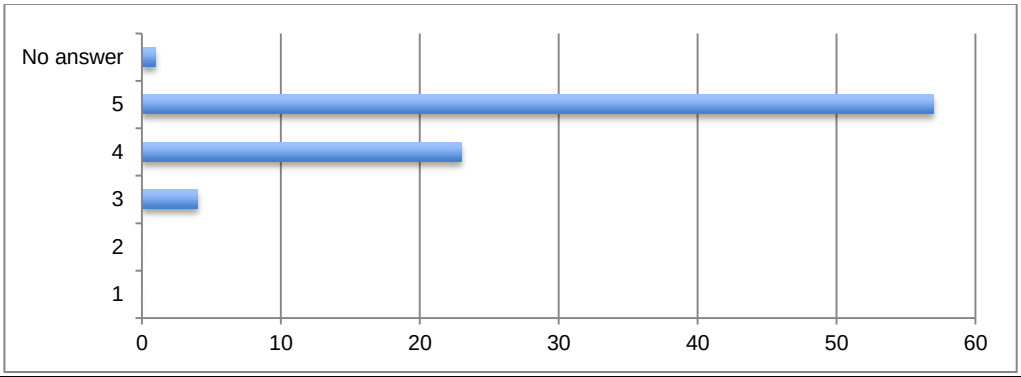
2.10 Please assess, to what extent that following persons/institutions are "responsible" for water problems.

- Farmers/producers



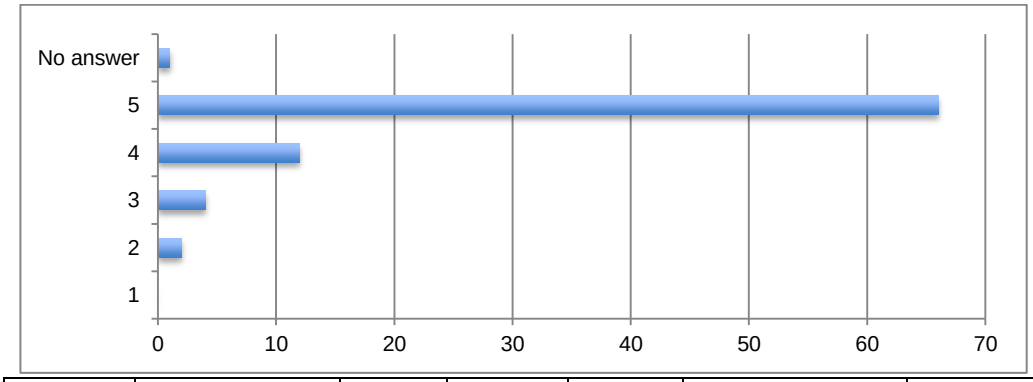
	1 Not responsible	2	3	4	5 Most responsible	No answer
Amount	0	4	14	40	27	0
Percent	0%	5%	16%	47%	32%	0%

- Business/Industry



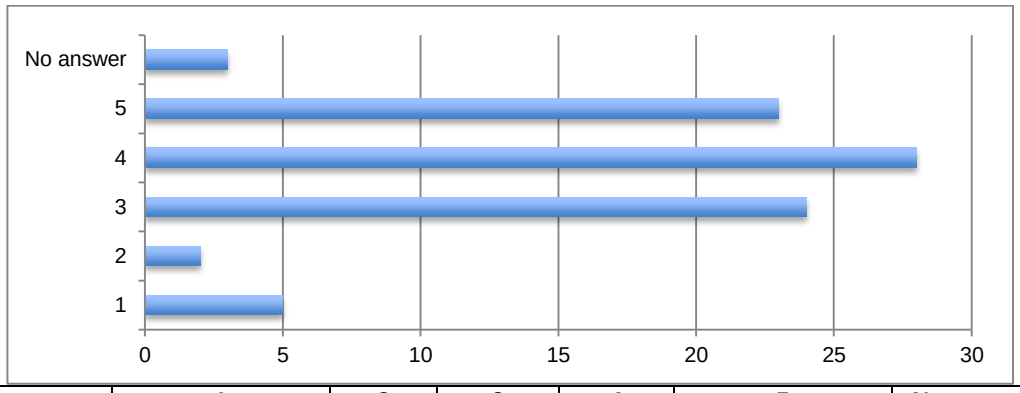
	1 Not responsible	2	3	4	5 Most responsible	No answer
Amount	0	0	4	23	57	1
Percent	0%	0%	5%	27%	67%	1%

- Politicians/government



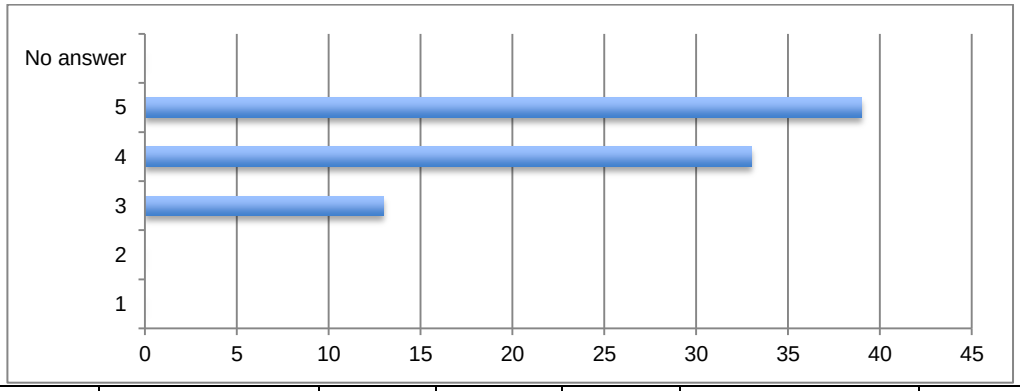
	1 Not responsible	2	3	4	5 Most responsible	No answer
Amount	0	2	4	12	66	1
Percent	0%	2%	5%	14%	78%	1%

- NGOs



	1 Not responsible	2	3	4	5 Most responsible	No answer
Amount	5	2	24	28	23	3
Percent	6%	2%	28%	33%	27%	4%

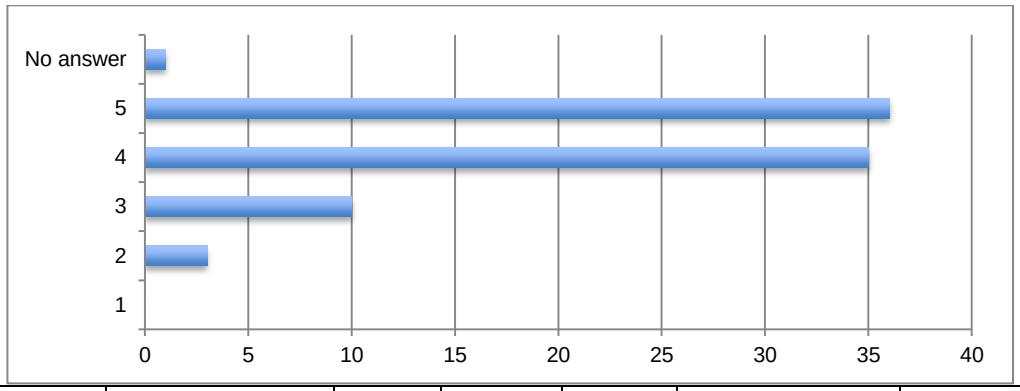
- Consumers



	1 Not responsible	2	3	4	5 Most responsible	No answer
Amount	0	0	13	33	39	0
Percent	0%	0%	15%	39%	46%	0%

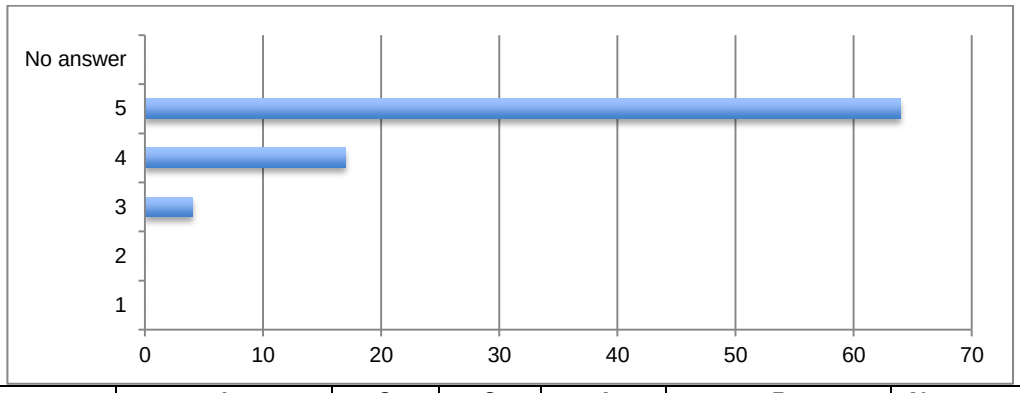
2.11 Please assess, to what extent that following persons/institutions should participate in "solving" water problems.

- Farmers/producers



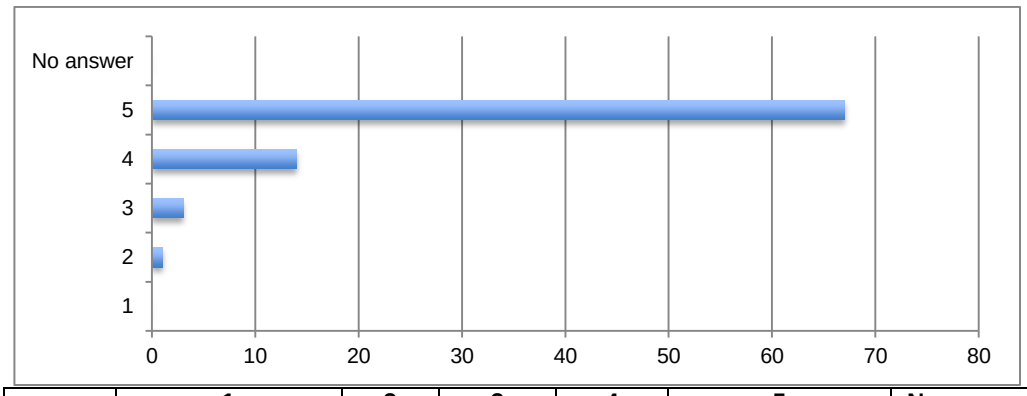
	1 Not responsible	2	3	4	5 Most responsible	No answer
Amount	0	3	10	35	36	1
Percent	0%	4%	12%	41%	42%	1%

- Business/Industry



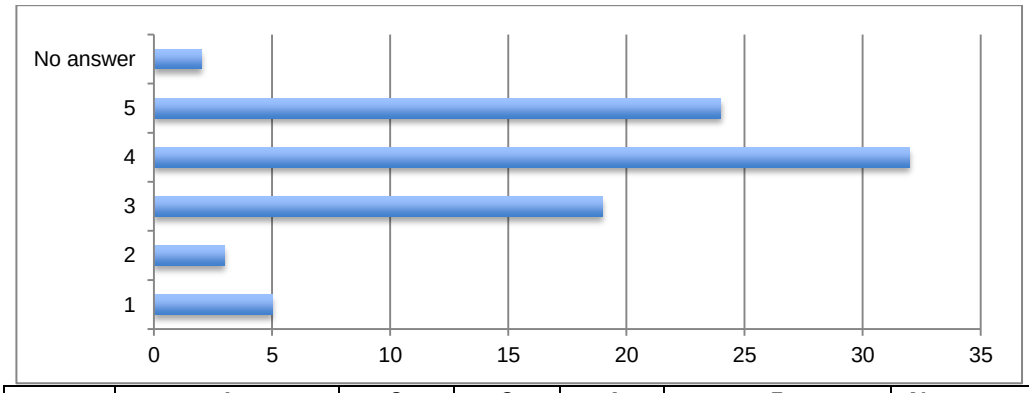
	1 Not responsible	2	3	4	5 Most responsi-ble	No answer
Amount	0	0	4	17	64	0
Percent	0%	0%	5%	20%	75%	0%

- Politicians/government



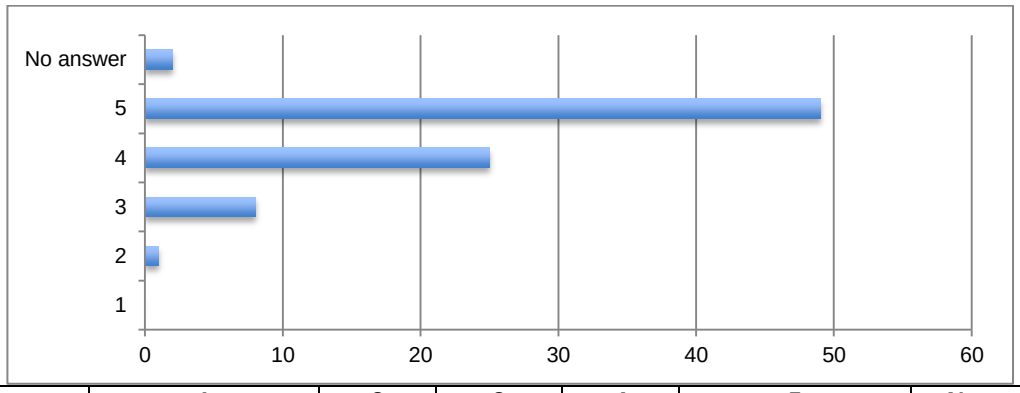
	1 Not responsible	2	3	4	5 Most responsi-ble	No answer
Amount	0	1	3	14	67	0
Percent	0%	1%	4%	16%	79%	0%

- NGOs



	1 Not responsible	2	3	4	5 Most responsible	No answer
Amount	5	3	19	32	24	2
Percent	6%	4%	22%	38%	28%	2%

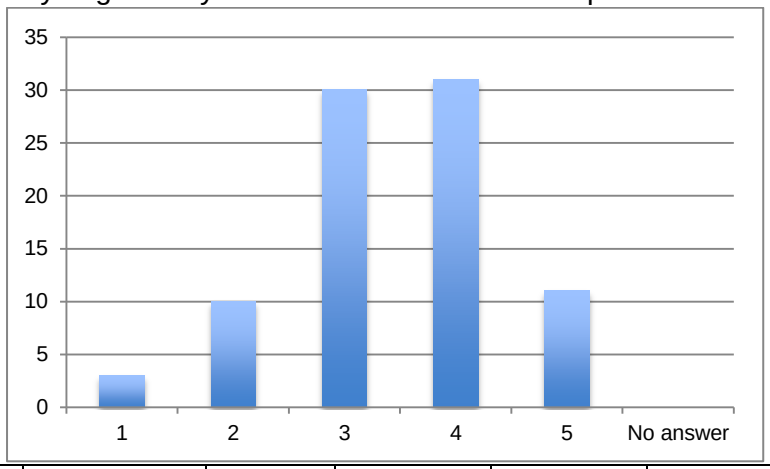
- Consumers



	1 Not responsible	2	3	4	5 Most responsible	No answer
Amount	0	1	8	25	49	2
Percent	0%	1%	9%	29%	58%	2%

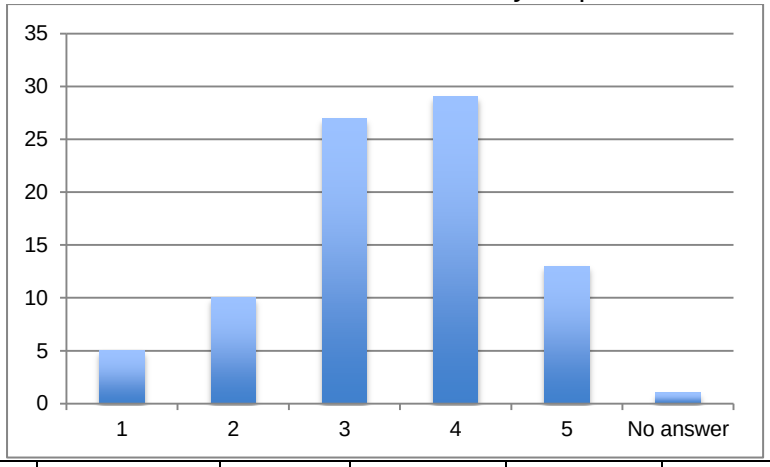
3. Product Water Footprint Label

3.1 Are you generally interested in Eco-label on a product?



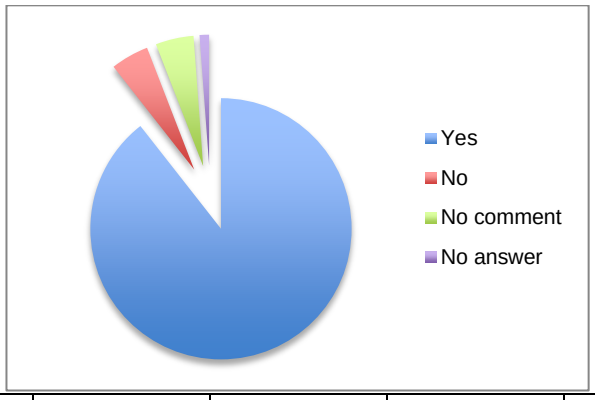
	1 Least	2	3	4	5 Most	No answer
Amount	3	10	30	31	11	0
Percent	4%	12%	35%	36%	13%	0%

3.2 Does an Eco-label have an influence on your purchase decision?



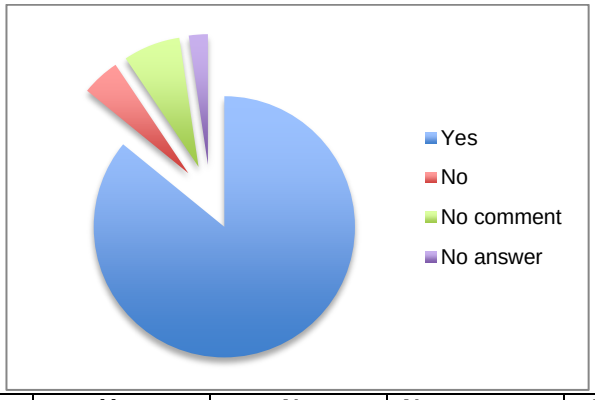
	1 Least	2	3	4	5 Most	No answer
Amount	5	10	27	29	13	1
Percent	6%	12%	32%	34%	15%	1%

3.3 A Water Footprint labeled product shows that the producer has already improved/adapted/developed its production process to use less water



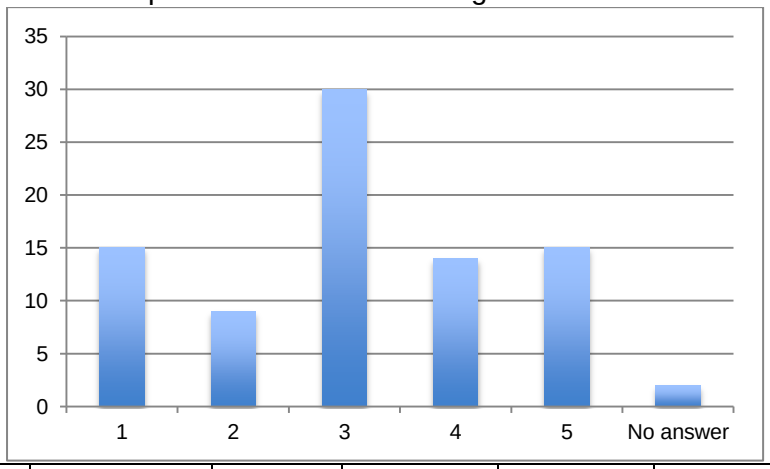
	Yes	No	No comment	No answer
Amount	76	4	4	1
Percent	89%	5%	5%	1%

3.4 A Water Footprint labeled product shows that the producer has the social responsibility by using less water in its production process.



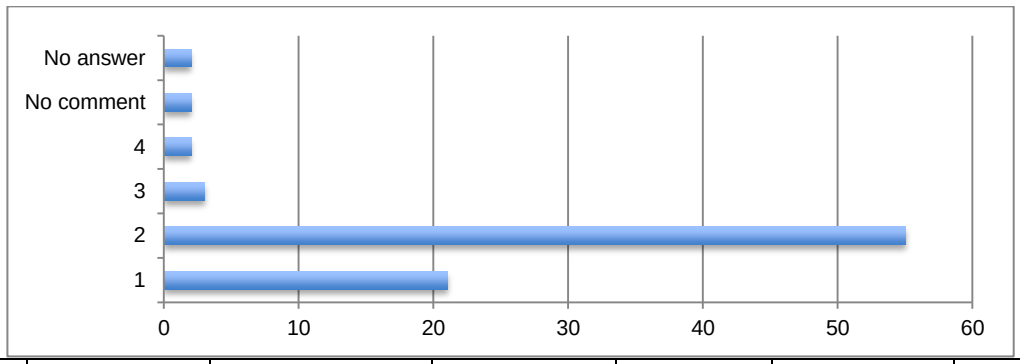
	Yes	No	No comment	No answer
Amount	73	4	6	2
Percent	86%	5%	7%	2%

3.5 Do you think that the quality of a Water Footprint labeled product is better than non-labeled products in the same range?



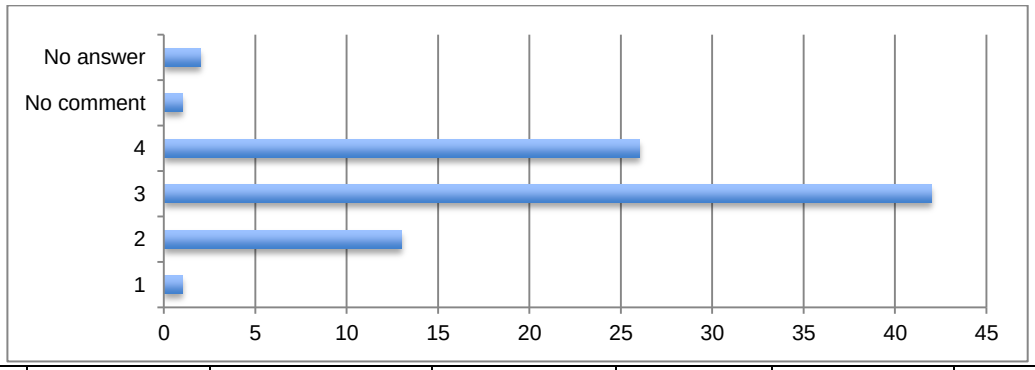
	1 Disagree	2	3	4	5 Agree	No answer
Amount	15	9	30	14	15	2
Percent	18%	11%	35%	16%	18%	2%

3.6 Is a Water Footprint label trustworthy, if it is put forward and is controlled by the third party?



	1 Definitely	2 To some extent	3 No, hardly	4 Not at all	No comment	No answer
Amount	21	55	3	2	2	2
Percent	25%	65%	4%	2%	2%	2%

3.7 Is a Water Footprint label trustworthy, if it is put forward and is controlled by the producer without third party's participation?

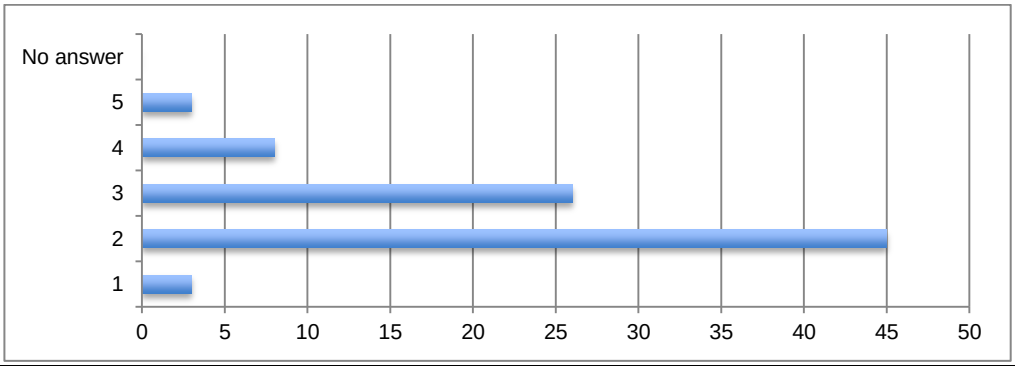


	1 Definitely	2 To some extent	3 No, hardly	4 Not at all	No comment	No answer
Amount	1	13	42	26	1	2
Percent	1%	15%	49%	31%	1%	2%

4. The role of consumer in supporting the Product Water Footprint Labeling

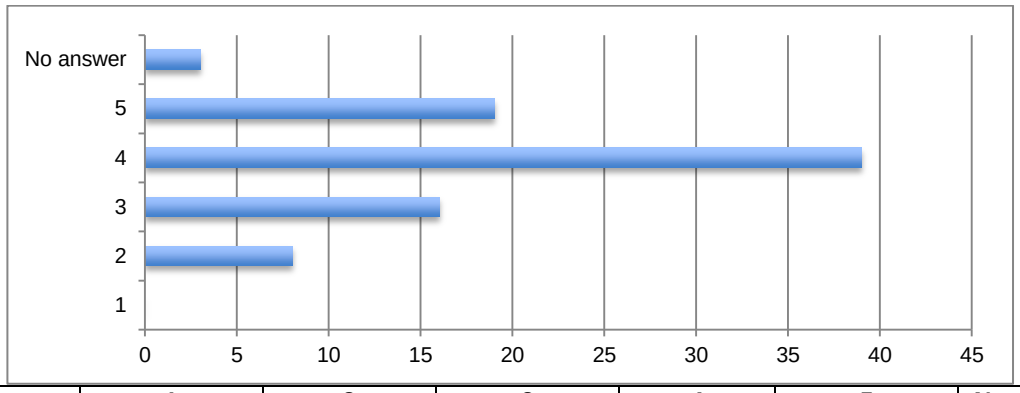
4.1 Please assess how often do you buy food and beverage products from the following options.

- Grocery store



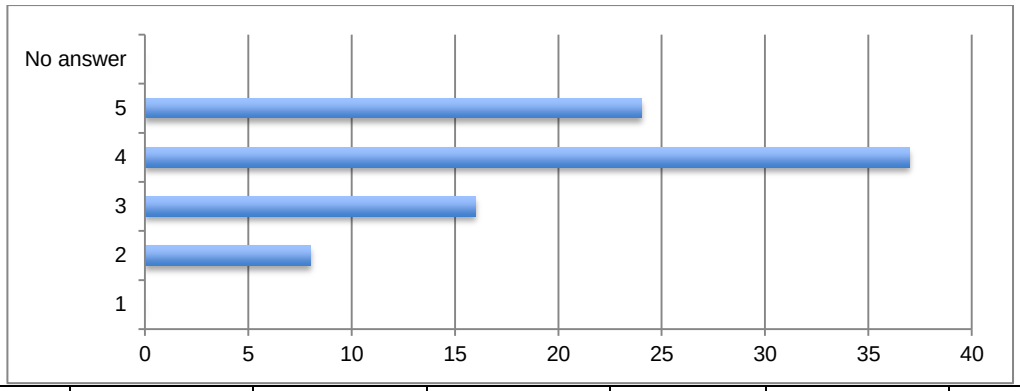
	1 Never	2	3	4	5 Always	No answer
Amount	3	45	26	8	3	0
Percent	4%	53%	31%	9%	4%	0%

- Convenient store e.g. 7-Eleven



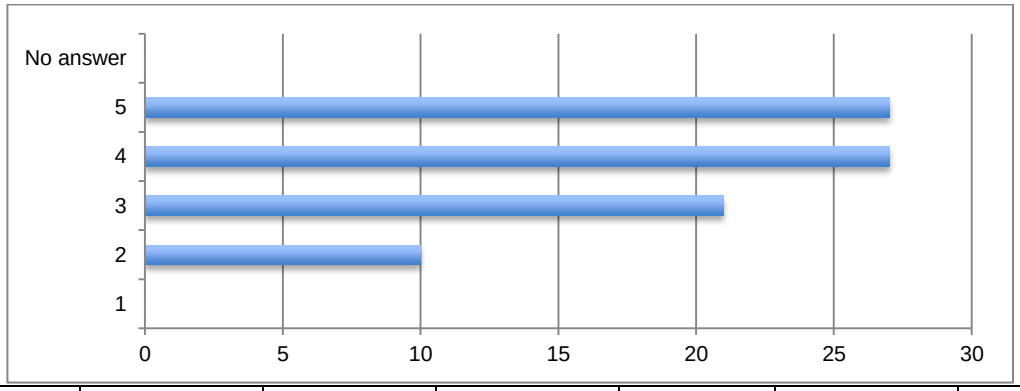
	1 Never	2	3	4	5 Always	No answer
Amount	0	8	16	39	19	3
Percent	0%	9%	19%	46%	22%	4%

- Supermarket e.g. Tops, Foodland, Gourmet Market, Villa Market



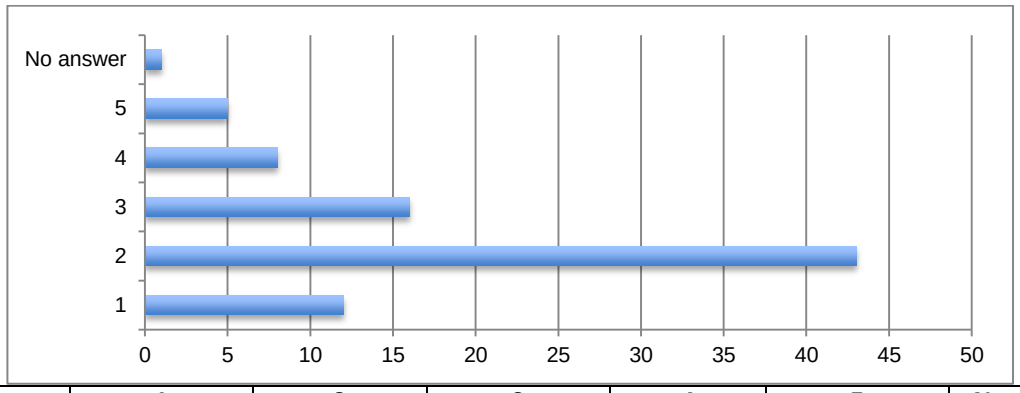
	1 Never	2	3	4	5 Always	No answer
Amount	0	8	16	37	24	0
Percent	0%	9%	19%	44%	28%	0%

- Discount store e.g. Lotus, Big C, Carrefour



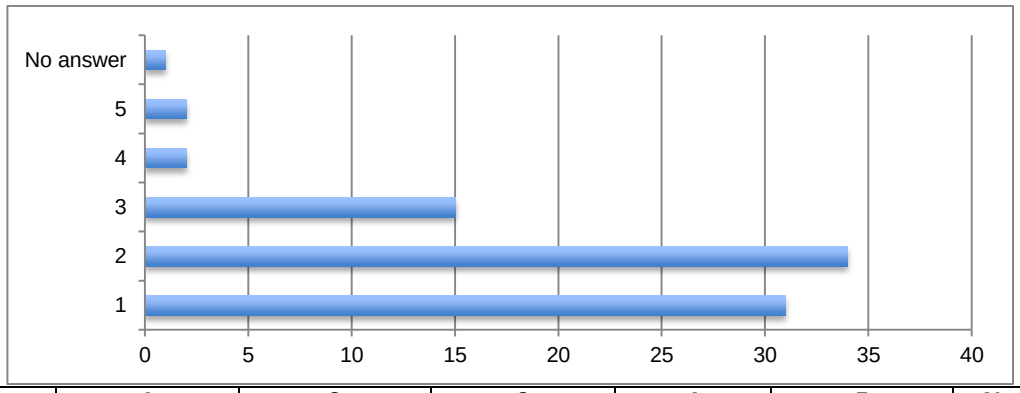
	1 Never	2	3	4	5 Always	No answer
Amount	0	10	21	27	27	0
Percent	0%	12%	25%	32%	32%	0%

- Wholesale e.g. Makro



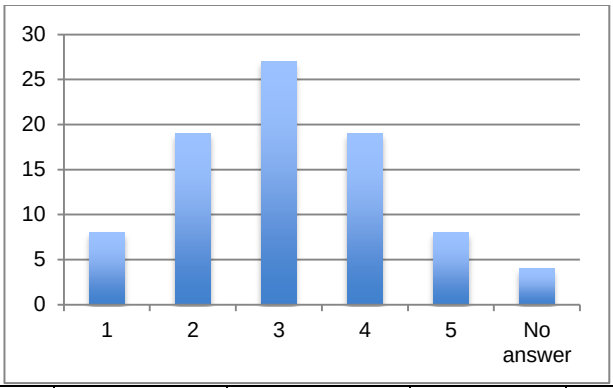
	1 Never	2	3	4	5 Always	No answer
Amount	12	43	16	8	5	1
Percent	14%	51%	19%	9%	6%	1%

- Farmers/producers



	1 Never	2	3	4	5 Always	No answer
Amount	31	34	15	2	2	1
Percent	36%	40%	18%	2%	2%	1%

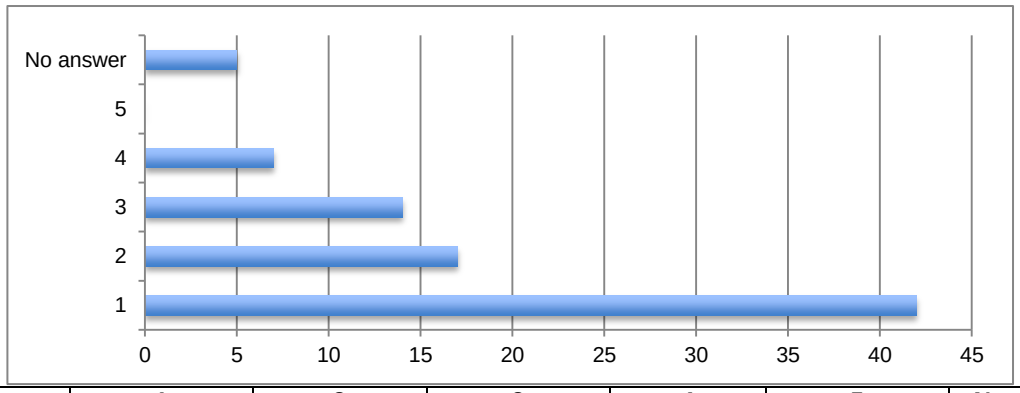
4.2 How often do you buy products with environmental labels (green label, carbon label etc.)?



	1 Never	2	3	4	5 Always	No answer
Amount	8	19	27	19	8	4
Percent	9%	22%	32%	22%	9%	5%

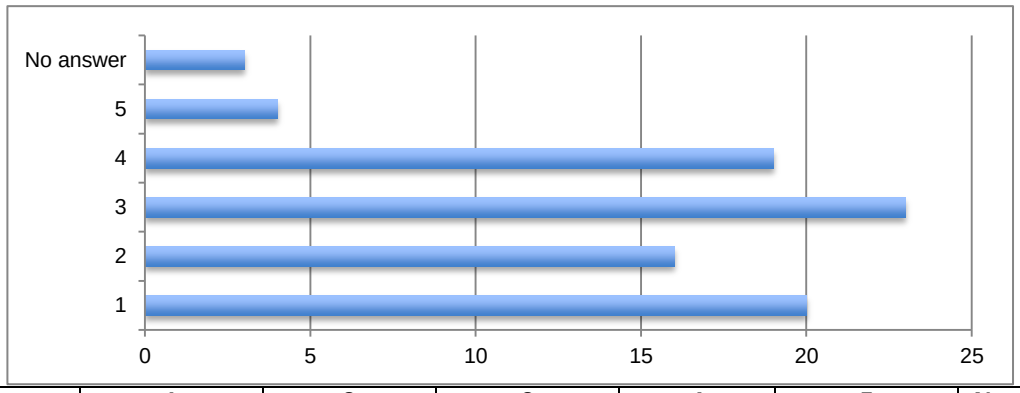
4.3 Please assess how often do you buy Eco-labeled food and beverage products from the following options.

- Grocery store



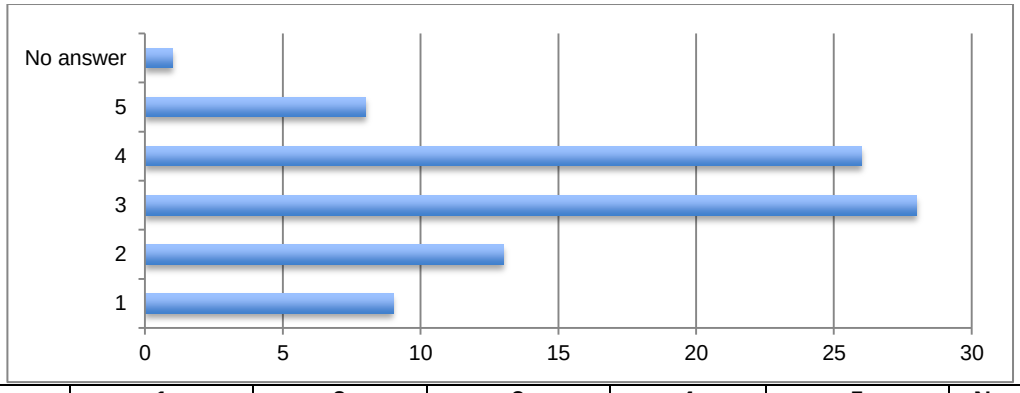
	1 Never	2	3	4	5 Always	No answer
Amount	42	17	14	7	0	5
Percent	49%	20%	16%	8%	0%	6%

- Convenient store e.g. 7-Eleven



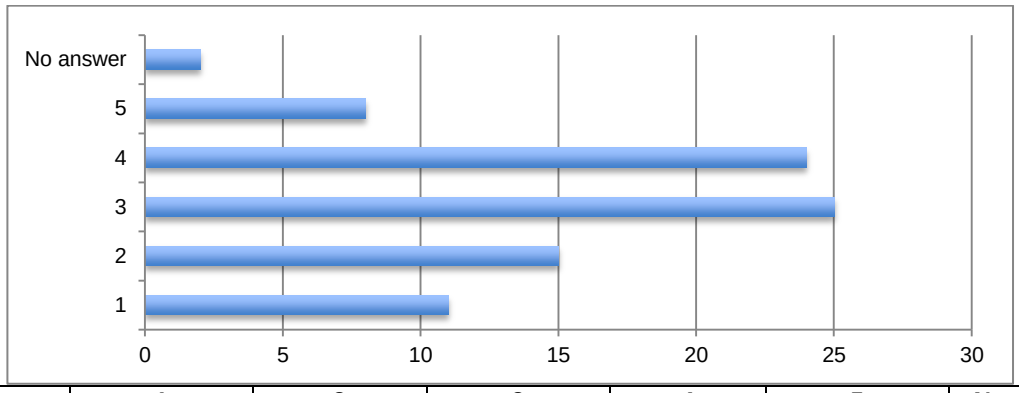
	1 Never	2	3	4	5 Always	No answer
Amount	20	16	23	19	4	3
Percent	24%	19%	27%	22%	5%	4%

- Supermarket e.g. Tops, Foodland, Gourmet Market, Villa Market



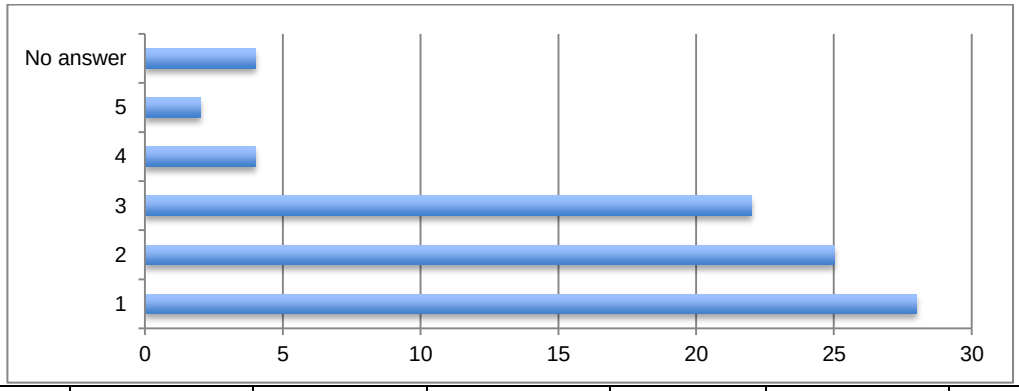
	1 Never	2	3	4	5 Always	No answer
Amount	9	13	28	26	8	1
Percent	11%	15%	33%	31%	9%	1%

- Discount store e.g. Lotus, Big C, Carrefour



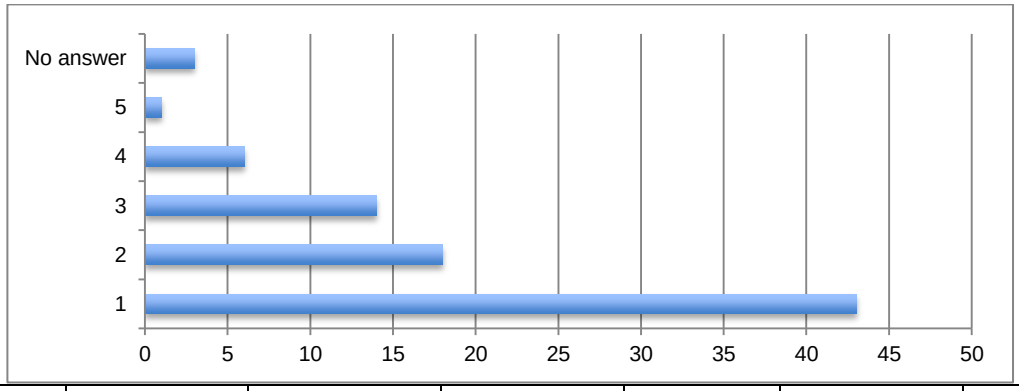
	1 Never	2	3	4	5 Always	No answer
Amount	11	15	25	24	8	2
Percent	13%	18%	29%	28%	9%	2%

- Wholesale e.g. Makro



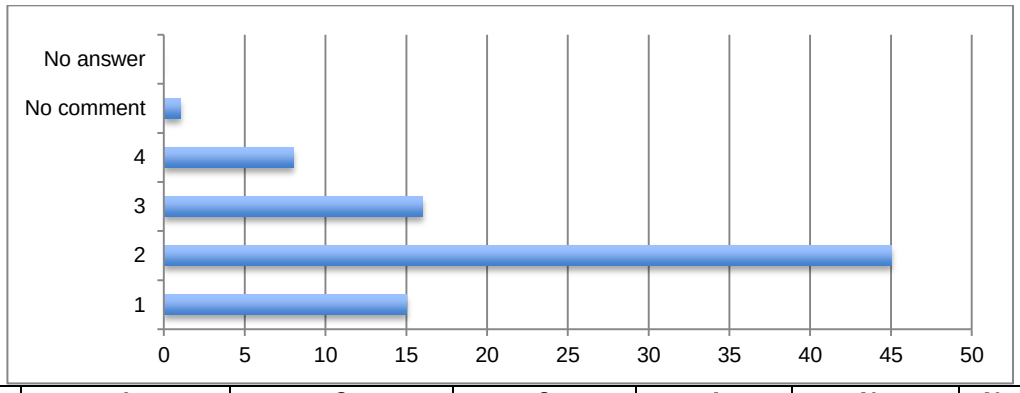
	1 Never	2	3	4	5 Always	No answer
Amount	28	25	22	4	2	4
Percent	33%	29%	26%	5%	2%	5%

- Farmers/producers



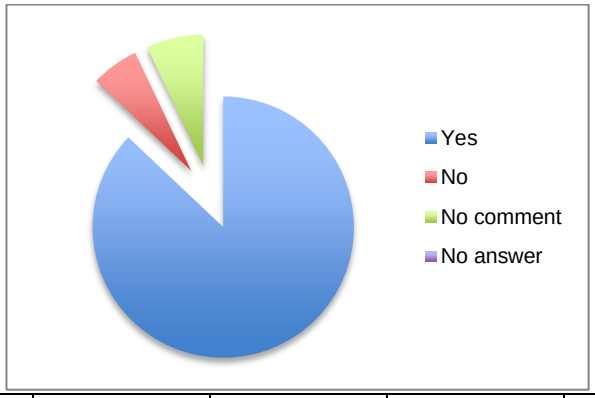
	1 Never	2	3	4	5 Always	No answer
Amount	43	18	14	6	1	3
Percent	51%	21%	16%	7%	1%	4%

4.4 Do you as a consumer can influence producers to make them display the water footprint of their products?



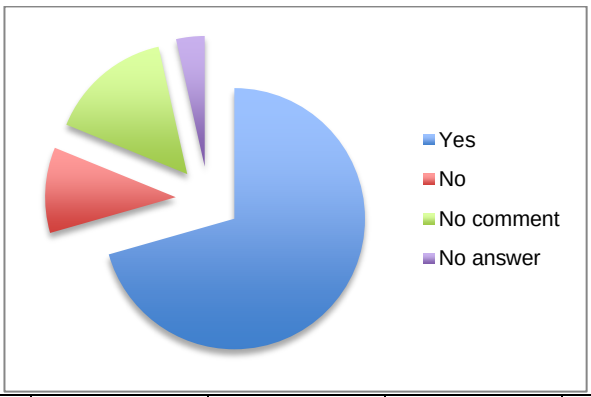
	1 Yes Absolutely	2 To some extent	3 No, hardly	4 Not at all	No comment	No answer
Amount	15	45	16	8	1	0
Percent	18%	53%	19%	9%	1%	0%

4.5 Do you agree? By purchasing water footprint labeled products you (as a consumer) can contribute to reduce water problems, because producers improve their production processes in order to use less water.



	Yes	No	No comment	No answer
Amount	74	5	6	0
Percent	87%	6%	7%	0%

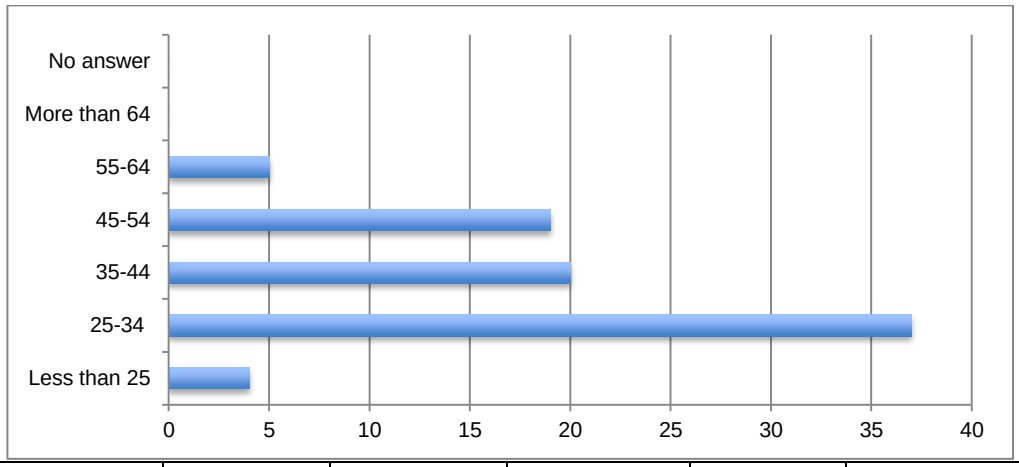
4.6 Would you recommend your friends to buy water footprint labeled food and beverage products?



	Yes	No	No comment	No answer
Amount	60	9	13	3
Percent	71%	11%	15%	4%

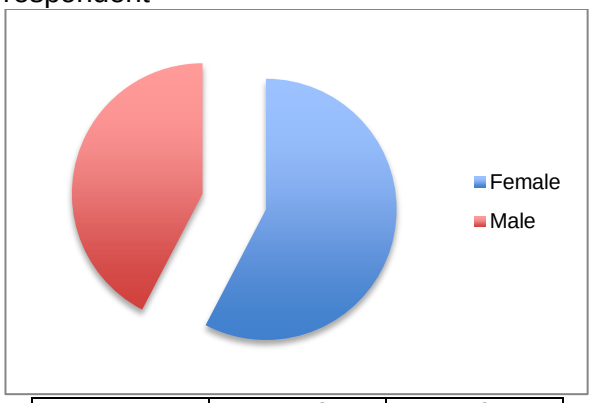
5. General information of respondent

5.1 Age of respondent (years)



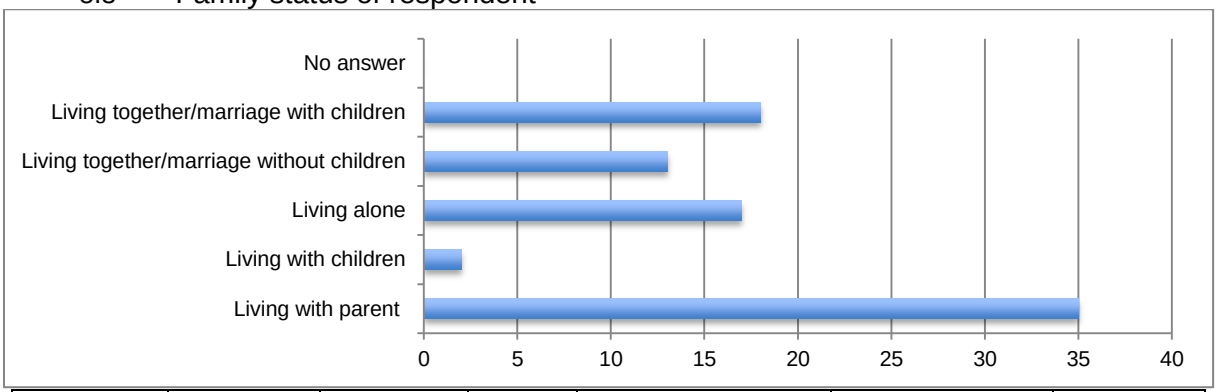
	Less than 25	25-34	35-44	45-54	55-64	More than 64	No answer
Amount	4	37	20	19	5	0	0
Percent	5%	44%	24%	22%	6%	0%	0%

5.2 Gender of respondent



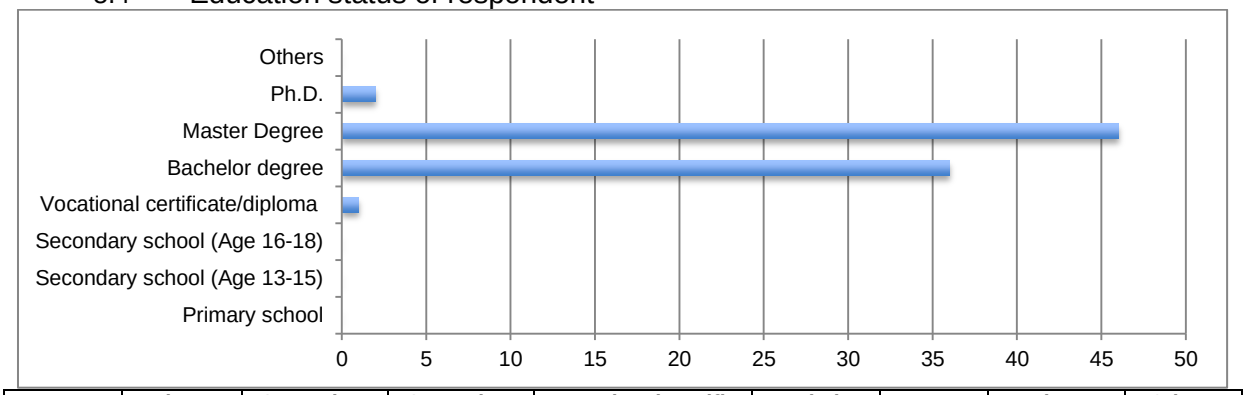
	Female	Male
Amount	49	36
Percent	58%	42%

5.3 Family status of respondent



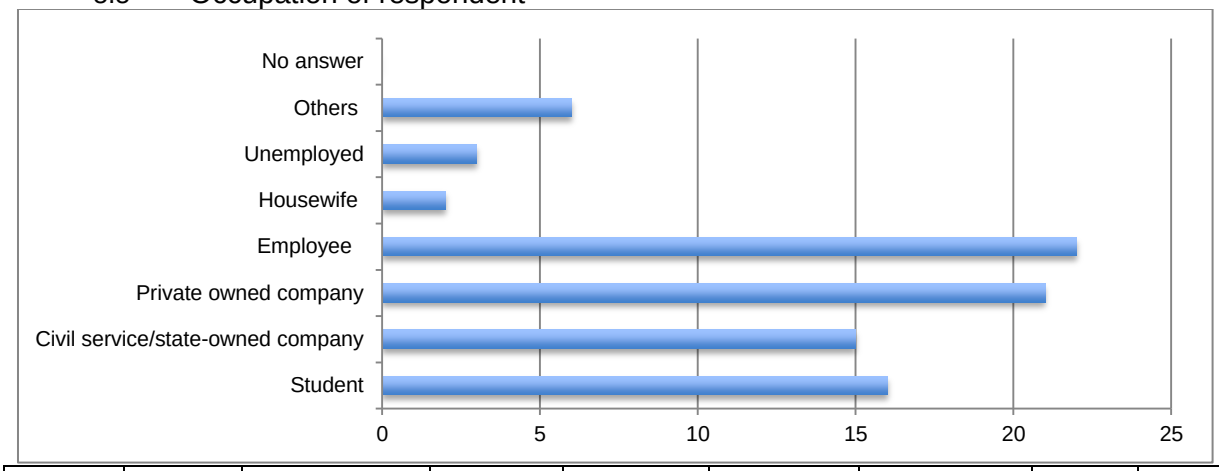
	Living with parent	Living with children	Living alone	Living togeth-er/marriage without children	Living togeth-er/marriage with children	No answer
Amount	35	2	17	13	18	0
Percent	41%	2%	20%	15%	21%	0%

5.4 Education status of respondent



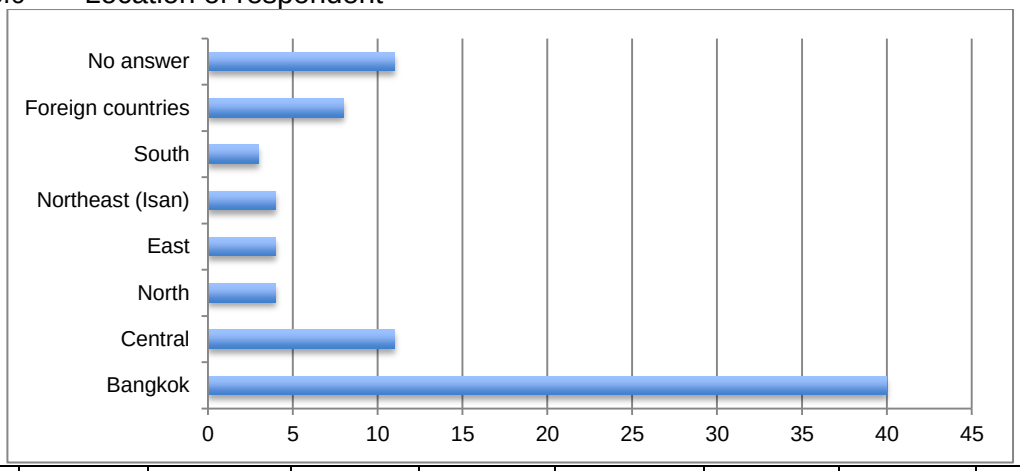
	Primary school	**Secondary school (Age 13-15)**	**Secondary school (Age 16-18)**	**Vocational certificate/diploma**	**Bachelor degree**	**Master Degree**	**Ph.D.**	**Others**
Amount	0	0	0	1	36	46	2	0
Percent	0%	0%	0%	1%	42%	54%	2%	0%

5.5 Occupation of respondent



	Student	Civil service/state-owned company	Private owned company	Employee	Housewife	Unemployed	Others	No answer
Amount	16	15	21	22	2	3	6	0
Percent	19%	18%	25%	26%	2%	4%	7%	0%

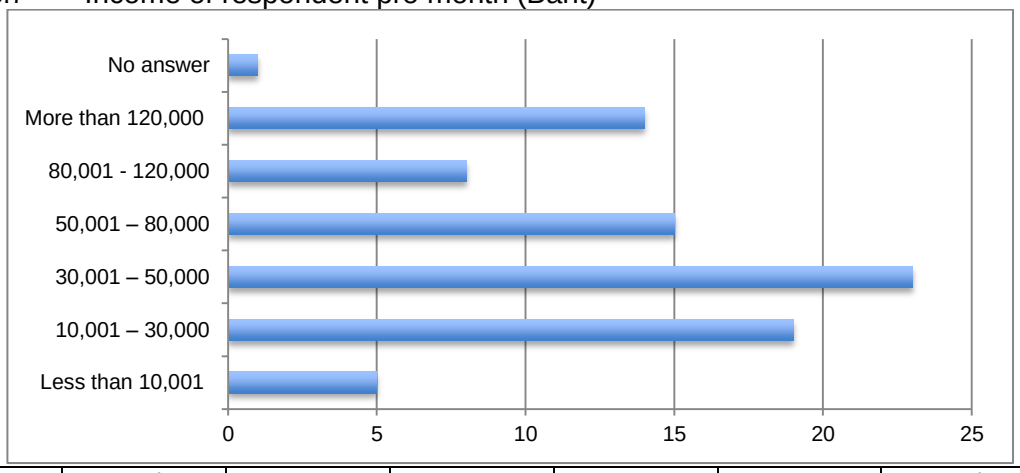
5.6 Location of respondent



	Bangkok	Central	North	East	Northeast (Isan)	South	Foreign countries	No answer
Amount	40	11	4	4	4	3	8	11
Percent	47%	13%	5%	5%	5%	4%	9%	13%

1. Central of Thailand includes Bangkok Metropolitan Region61 (1), Nakhon Pathom (1), Nonthaburi (7), Pathum Thani (1), Phra Nakhon Si Ayutthaya (1).
2. North of Thailand includes Chiang Mai (3), Lamphun (1).
3. East of Thailand includes Chonburi (1), Rayong (1), Trat (2).
4. Northeast of Thailand includes Buri Ram (1), Nakhon Ratchasima (1), Surin (1), Ubon Ratchathani (1).
5. South of Thailand includes Pattani (2), Trang (1).
6. Foreign countries include Germany (1), Hawaii, U.S. (1), Massachusett, U.S. (1), not in Thailand (2), Padova, Italy (1), Sweden (1), Switzerland (1).

5.7 Income of respondent pro month (Baht)



	Less than 10,001	10,001 – 30,000	30,001 – 50,000	50,001 – 80,000	80,001 - 120,000	More than 120,000	No answer
Amount	5	19	23	15	8	14	1
Percent	6%	22%	27%	18%	9%	16%	1%

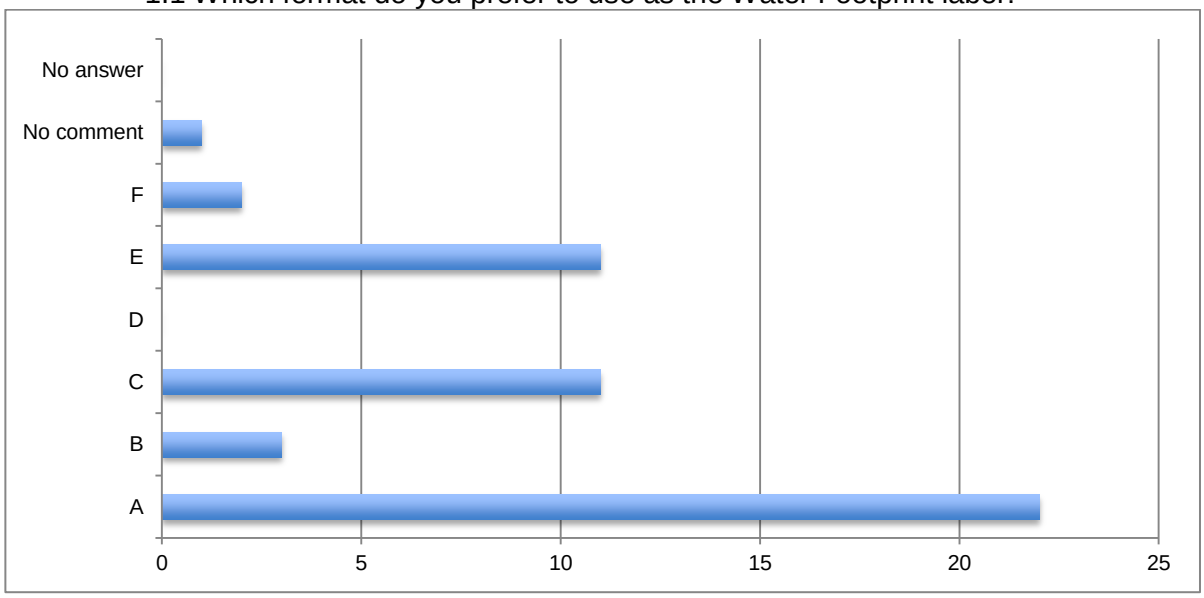
[61] Bangkok Metropolitan Region includes Nakhon Pathom, Nonthaburi, Pathum Thani, Samut Prakan and Samut Sakhon.

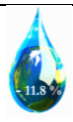
Paper-based survey questionnaire

Fifty respondents participate in the paper-based survey questionnaire.

1. Questions from video

1.1 Which format do you prefer to use as the Water Footprint label?



	A	B	C	D	E	F	No comment	No answer
Label								
Description	See more detail in the introduction part of the research.							
Amount	22	3	11	0	11	2	1	0
Percent	44%	6%	22%	0%	22%	4%	2%	0%

1.2 Why?

<u>The water drop with the earth</u>

- It is nice, polite, attractive and easy to understand
- The water drop directly communicates about water and suits with every nation in the world.
- The water drop looks more polite than the footprint.
- The footprint should not be on food packages.

<u>The footprint</u>

- The footprint is a unique logo.
- The footprint refers to the water footprint concept.

<u>3,000 l/kg with average 3,400 l/kg</u>

- Easy to understand
- Comparison between actual water footprints and average water footprints makes it easy for consumers to understand and see the difference.
- There is no minus signal on the logo.

<u>- 400 l/kg with average 3,400 l/kg</u>

- It is easy to understand at a glance how much water is saved.

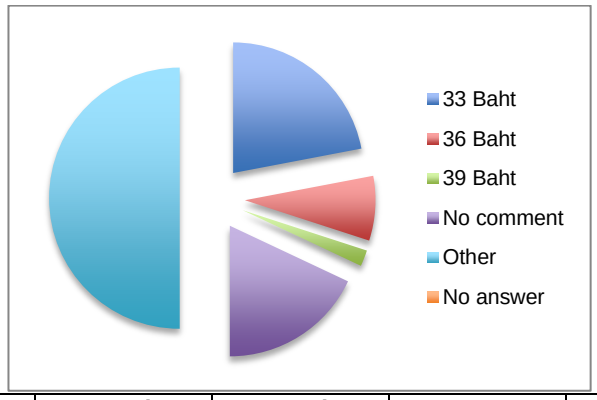
<u>-11.8%</u>

- Percentage provides a clear picture of water saving.
- Easy to understand and compare with other competitors

<u>No comment</u>

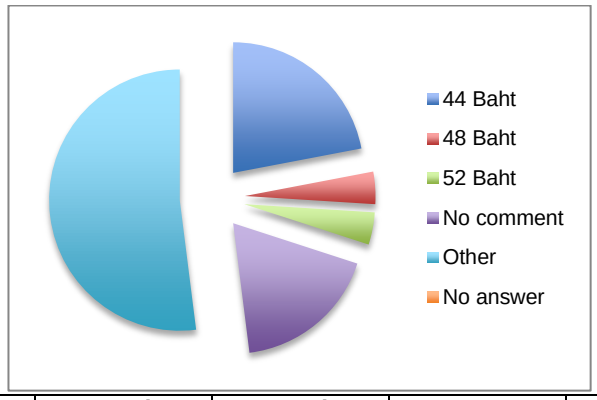
- It is unreasonable.

1.3 How much do you want to pay for 10 Water Footprint labeled eggs? (If 10 conventional eggs cost 30 Baht)



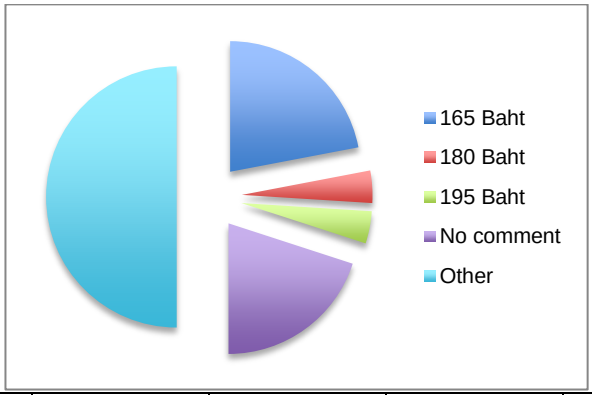
	33 Baht	36 Baht	39 Baht	No comment	Other	No answer
Amount	11	4	1	9	25	0
Percent	22%	8%	2%	18%	50%	0%

1.4 How much do you want to pay for Water Footprint labeled 1 liter of milk? (If conventional 1 liter of milk costs 40 Baht)



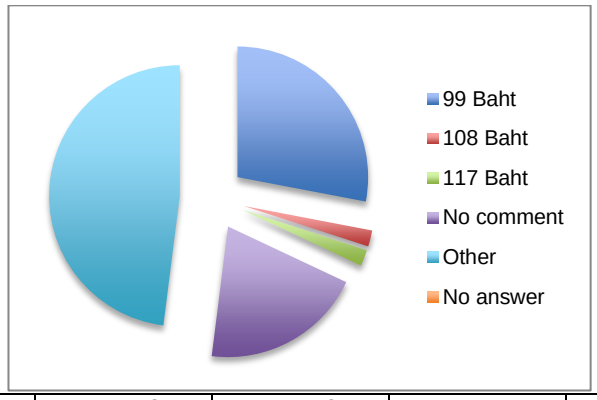
	44 Baht	48 Baht	52 Baht	No comment	Other	No answer
Amount	11	2	2	9	26	0
Percent	22%	4%	4%	18%	52%	0%

1.5 How much do you want to pay for Water Footprint labeled 5 kg rice? (If conventional 5 kg rice cost 150 Baht)



	165 Baht	180 Baht	195 Baht	No comment	Other	No answer
Amount	11	2	2	10	25	0
Percent	22%	4%	4%	20%	50%	0%

1.6 How much do you want to pay for Water Footprint labeled 1 kg chicken meat? (If conventional 1 kg chicken meat costs 90 Baht)



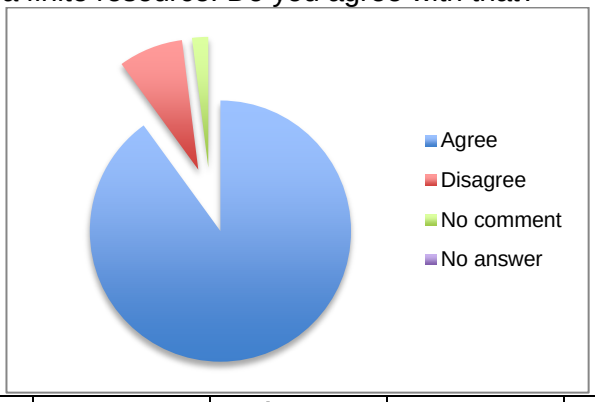
	99 Baht	108 Baht	117 Baht	No comment	Other	No answer
Amount	14	1	1	10	24	0
Percent	28%	2%	2%	20%	48%	0%

Other (for questions 1.3 – 1.6)

- Same price as usual
- 31 Baht/41 Baht/155 Baht/93 Baht
- Prices should be decreased because costs of water use are reduced as a result of water saving in production processes.

2 Water

2.1 Water is a finite resource. Do you agree with that?



	Agree	Disagree	No comment	No answer
Amount	45	4	1	0
Percent	90%	8%	2%	0%

2.2 Why?

Agree

- Awareness about water scarcity is necessary.
- Population growth and water consumption are not compatible with water resources.
- Global warming causes water scarcities.
- Freshwater is limited.
- Insufficient forests lead to water scarcities.
- We have poor water management plans.
- Clean water is limited.
- We should conserve water in everyday life.

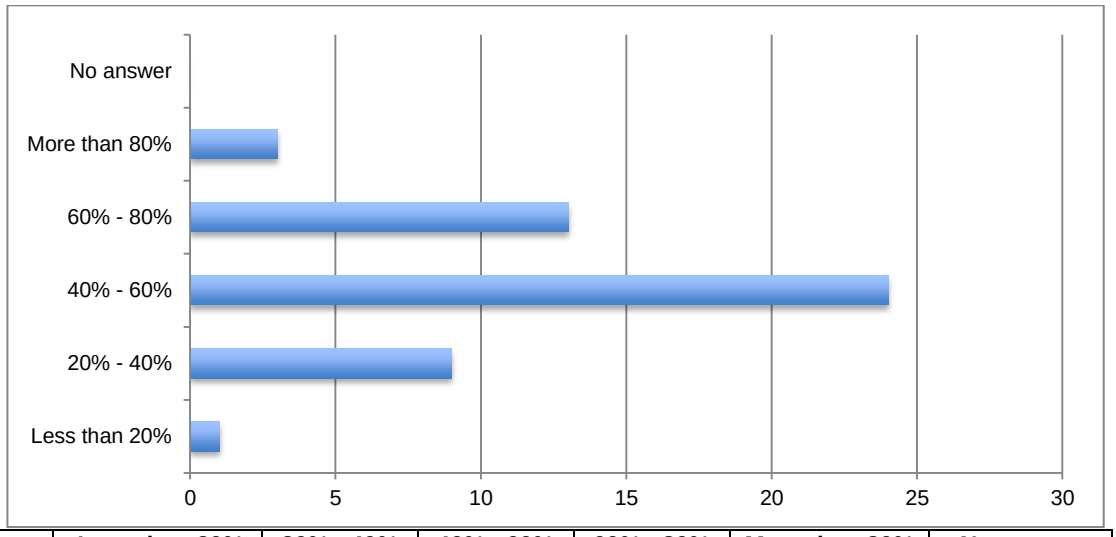
Disagree

- In fact, poor water governances cause water scarcities.
- Clean water is limited.
- Water can be reused.

No comment

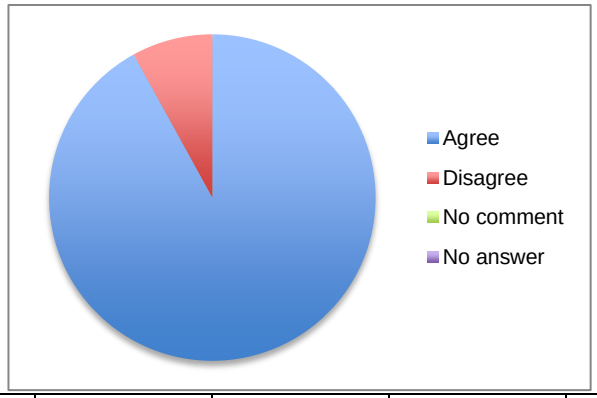
- In the future, we can produce or reuse water by new technologies. However, we should carefully use it at this moment.

2.3 Please assess the extent, agriculture contributes to the global use of water (in percent).



	Less than 20%	20% - 40%	40% - 60%	60% - 80%	More than 80%	No answer
Amount	1	9	24	13	3	0
Percent	2%	18%	48%	26%	6%	0%

2.4 "No water = No food" do you agree with that?



	Agree	Disagree	No comment	No answer
Amount	46	4	0	0
Percent	92%	8%	0%	0%

2.5 Why?

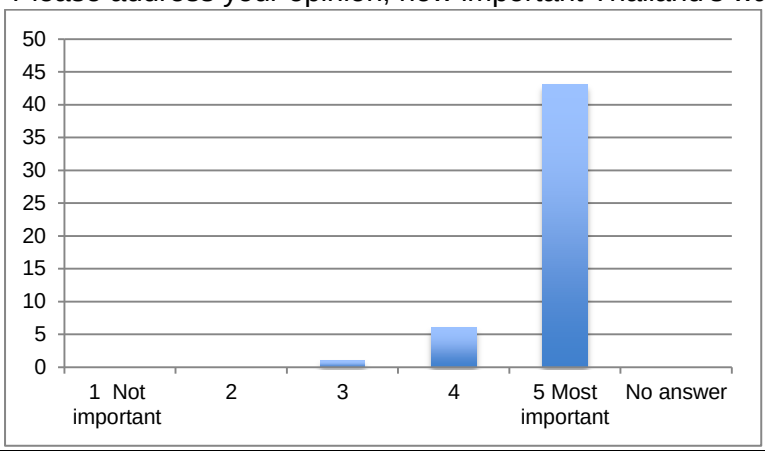
<u>Agree</u>

- Water is the main factor of agriculture.
- Without water there will be no plant and food for both animals and human being.
- Agriculture sector needs water as well as food industry sector.
- We cannot live without water.

<u>Disagree</u>

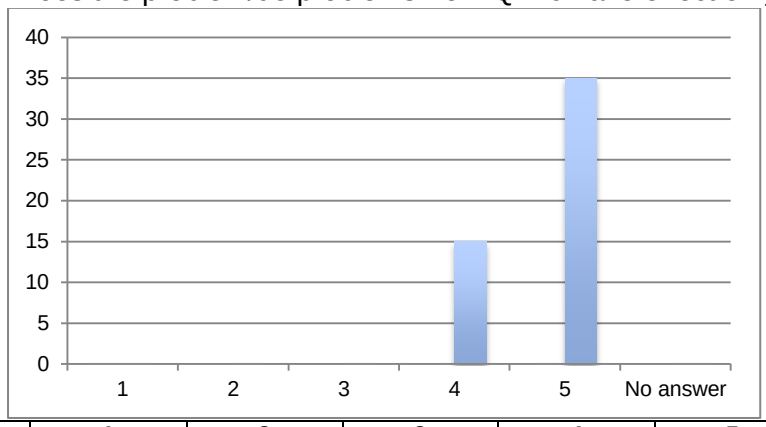
- Water is more important than food.
- We cannot live without water but we can live without food.

2.6 Please address your opinion, how important Thailand's water problems is.



	1 Not important	2	3	4	5 Most important	No answer
Amount	0	0	1	6	43	0
Percent	0%	0%	2%	12%	86%	0%

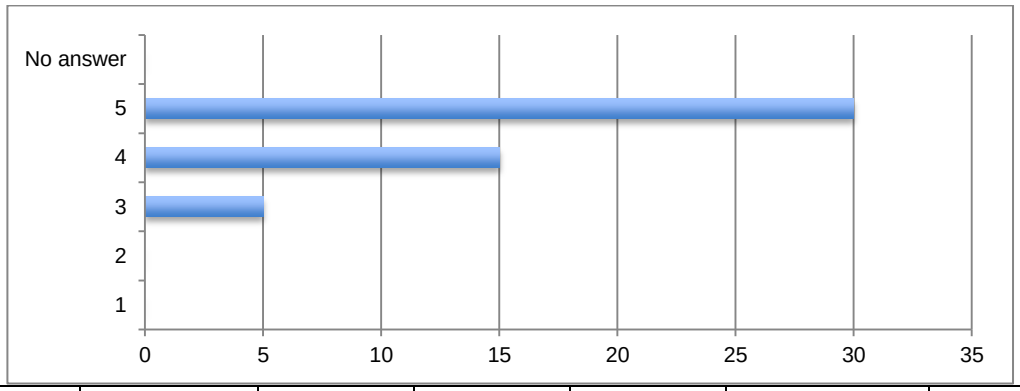
2.7 Does the problem/do problems from Q 2.6 have effect on your personal life?



	1 No impact	2	3	4	5 Big impact	No answer
Amount	0	0	0	15	35	0
Percent	0%	0%	0%	30%	70%	0%

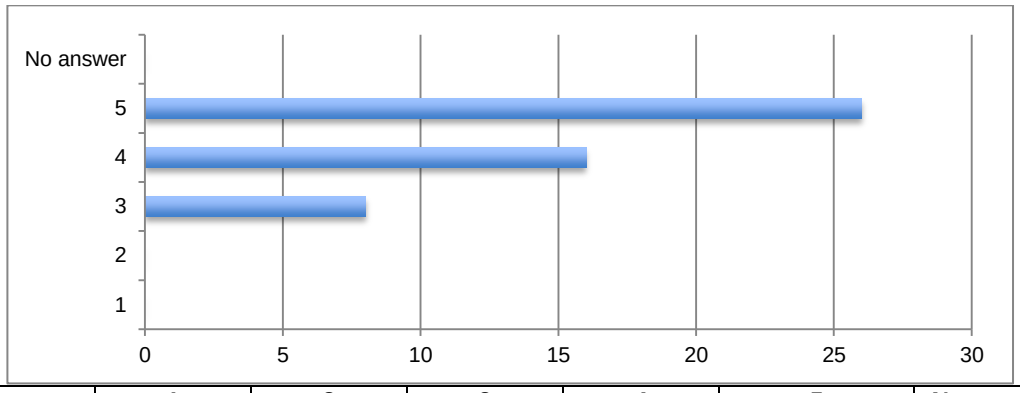
2.8 Please assess, how much the following causes contribute to water problems in Thailand.

- Global warming that causes droughts, unseasonal rain, and floods



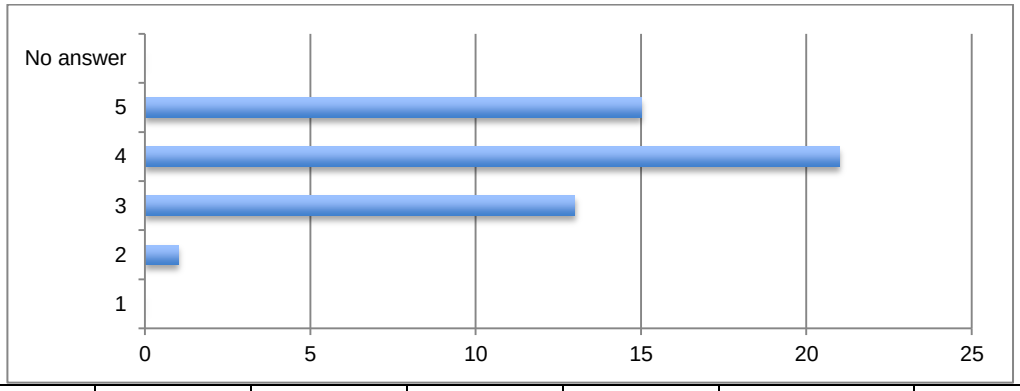
	1 Irrelevant	2	3	4	5 Most relevant	No answer
Amount	0	0	5	15	30	0
Percent	0%	0%	10%	30%	60%	0%

- Population growth that increases demand for water (drink water and for daily life: sanitation etc.)



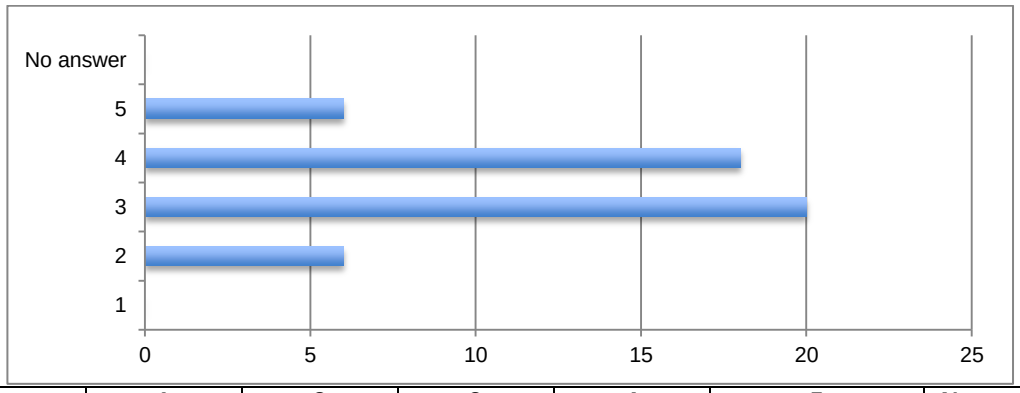
	1 Irrelevant	2	3	4	5 Most relevant	No answer
Amount	0	0	8	16	26	0
Percent	0%	0%	16%	32%	52%	0%

- Trend of water hungry lifestyles (too often car washing, bath, etc.)



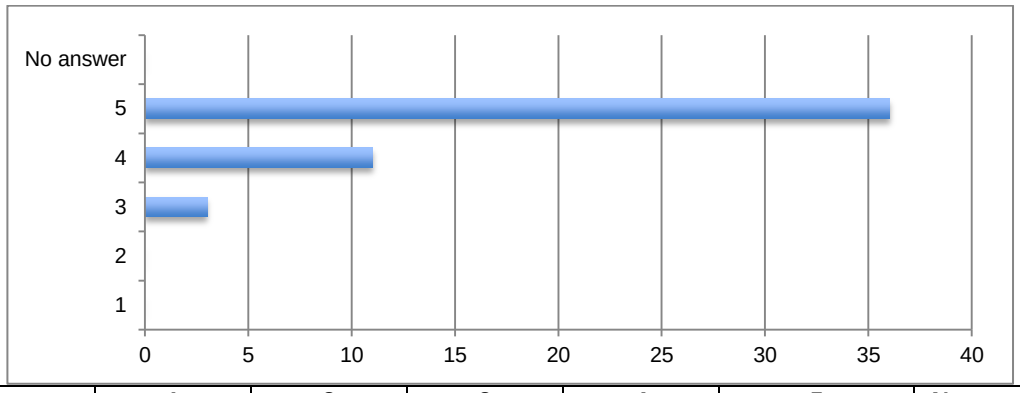
	1 Irrelevant	2	3	4	5 Most relevant	No answer
Amount	0	1	13	21	15	0
Percent	0%	2%	26%	42%	30%	0%

- Agriculture uses water inefficiently or carelessly



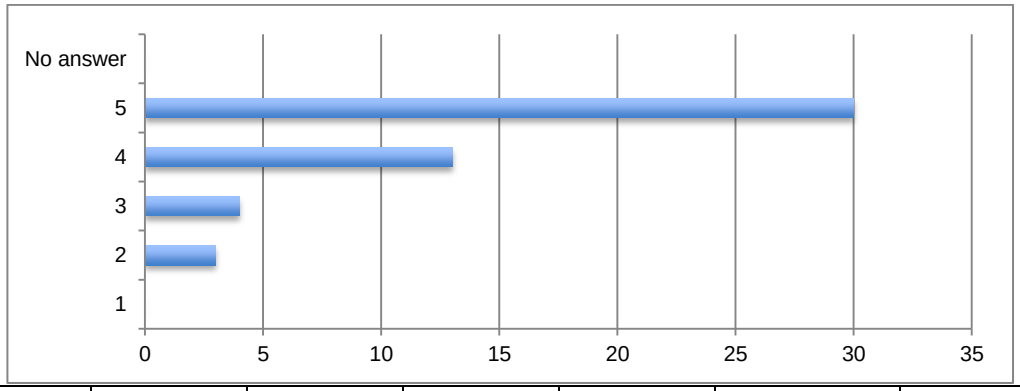
	1 Irrelevant	2	3	4	5 Most relevant	No answer
Amount	0	6	20	18	6	0
Percent	0%	12%	40%	36%	12%	0%

- Industries release waste water without (proper) treatment



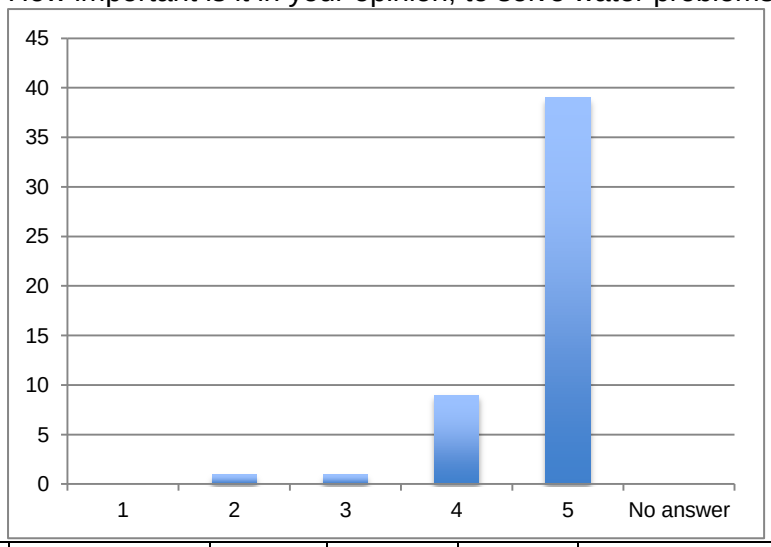
	1 Irrelevant	2	3	4	5 Most relevant	No answer
Amount	0	0	3	11	36	0
Percent	0%	0%	6%	22%	72%	0%

- Lack of efficient water management policy from the government



	1 Irrelevant	2	3	4	5 Most relevant	No answer
Amount	0	3	4	13	30	0
Percent	0%	6%	8%	26%	60%	0%

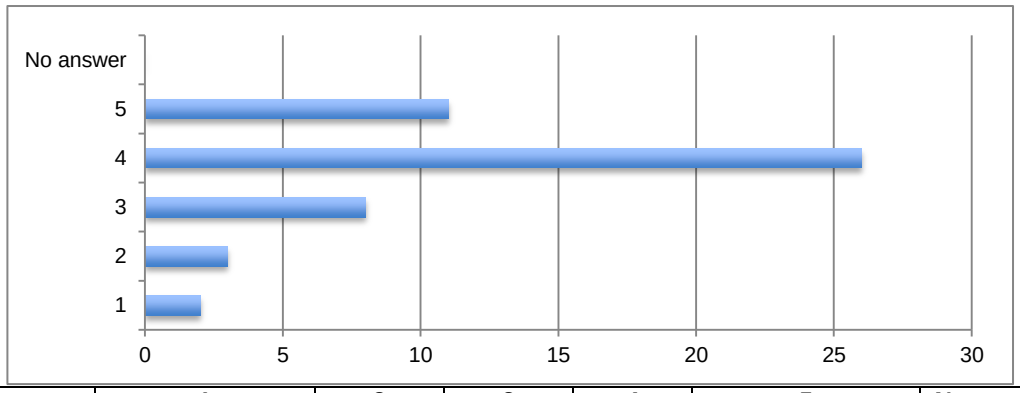
2.9 How important is it in your opinion, to solve water problems in Thailand?



	1 Not important	2	3	4	5 Most important	No answer
Amount	0	1	1	9	39	0
Percent	0%	2%	2%	18%	78%	0%

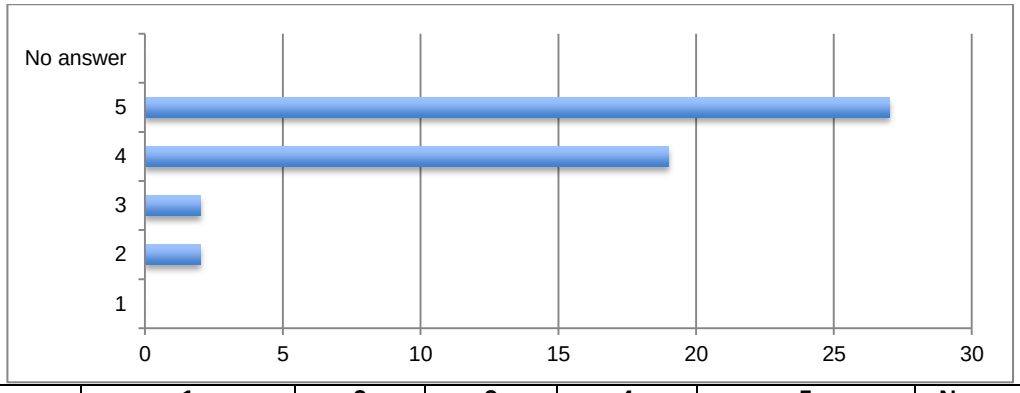
2.10 Please assess, to what extent that following persons/institutions are "responsible" for water problems.

- Farmers/producers



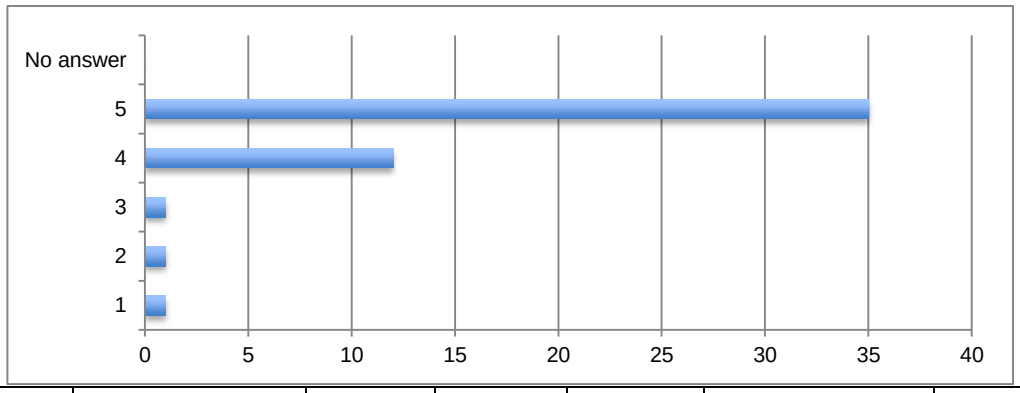
	1 Not responsible	2	3	4	5 Most responsible	No answer
Amount	2	3	8	26	11	0
Percent	4%	6%	16%	52%	22%	0%

- Business/Industry



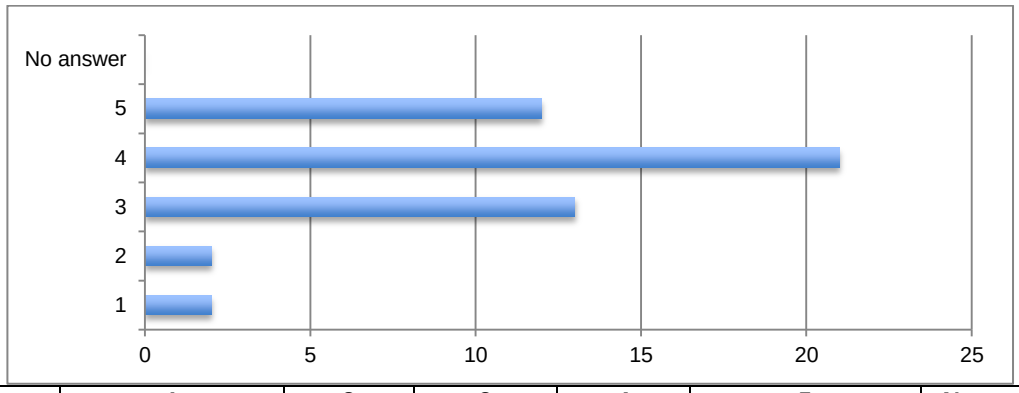
	1 Not responsible	2	3	4	5 Most responsi-ble	No answer
Amount	0	2	2	19	27	0
Percent	0%	4%	4%	38%	54%	0%

- Politicians/government



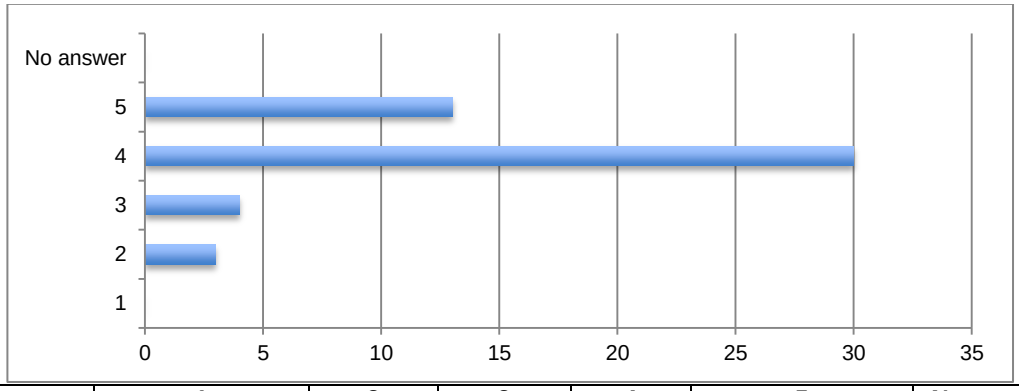
	1 Not responsible	2	3	4	5 Most responsible	No answer
Amount	1	1	1	12	35	0
Percent	2%	2%	2%	24%	70%	0%

- NGOs



	1 Not responsible	2	3	4	5 Most responsible	No answer
Amount	2	2	13	21	12	0
Percent	4%	4%	26%	42%	24%	0%

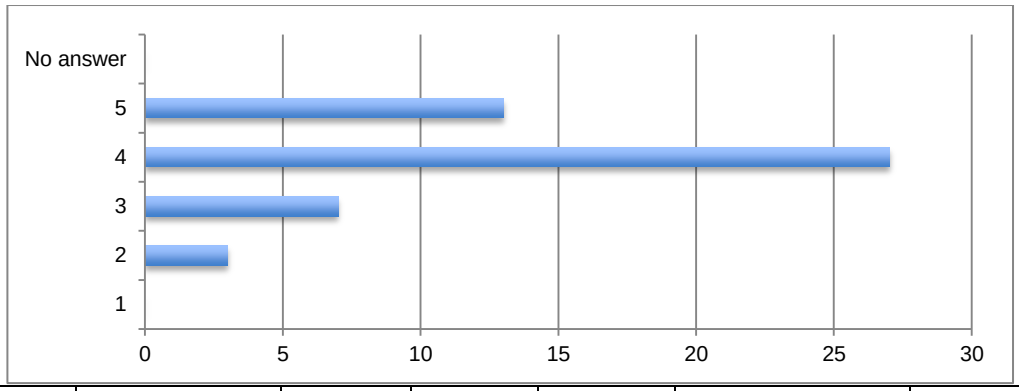
- Consumers



	1 Not responsible	2	3	4	5 Most responsi-ble	No answer
Amount	0	3	4	30	13	0
Percent	0%	6%	8%	60%	26%	0%

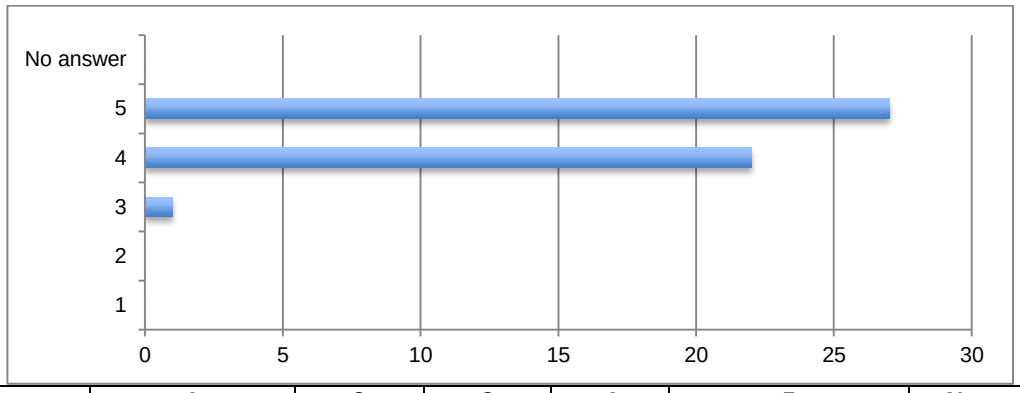
2.11 Please assess, to what extent that following persons/institutions should participate in "solving" water problems.

- Farmers/producers



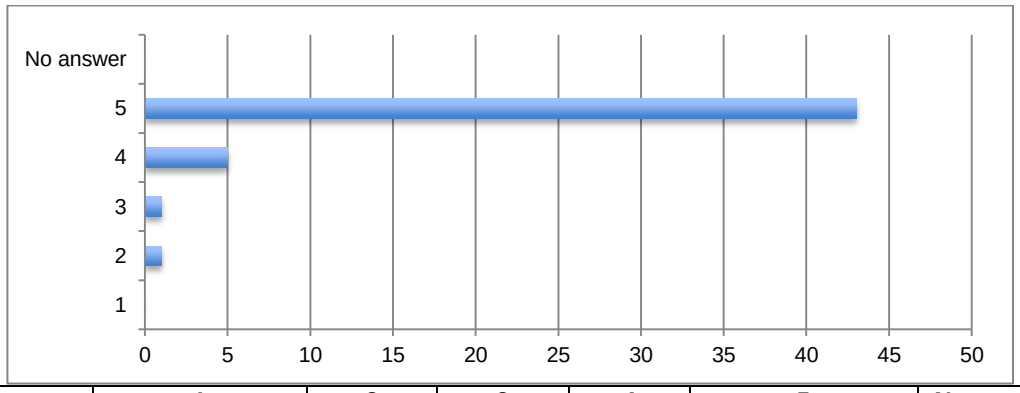
	1 Not responsi-ble	2	3	4	5 Most responsible	No answer
Amount	0	3	7	27	13	0
Percent	0%	6%	14%	54%	26%	0%

- Business/Industr



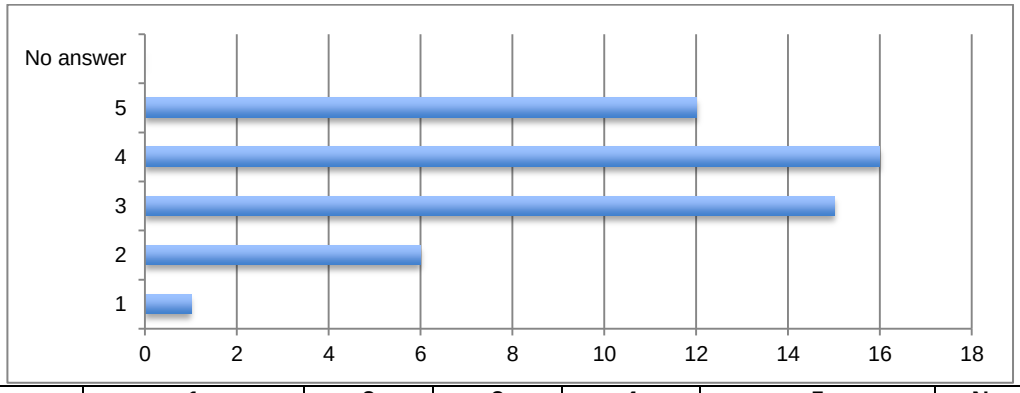
	1 Not responsible	2	3	4	5 Most responsible	No answer
Amount	0	0	1	22	27	0
Percent	0%	0%	2%	44%	54%	0%

- Politicians/government



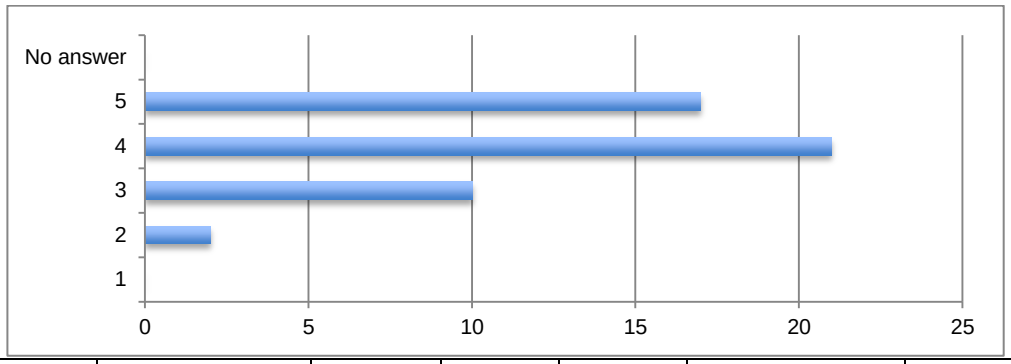
	1 Not responsible	2	3	4	5 Most responsible	No answer
Amount	0	1	1	5	43	0
Percent	0%	2%	2%	10%	86%	0%

- NGOs



	1 Not responsible	2	3	4	5 Most responsible	No answer
Amount	1	6	15	16	12	0
Percent	2%	12%	30%	32%	24%	0%

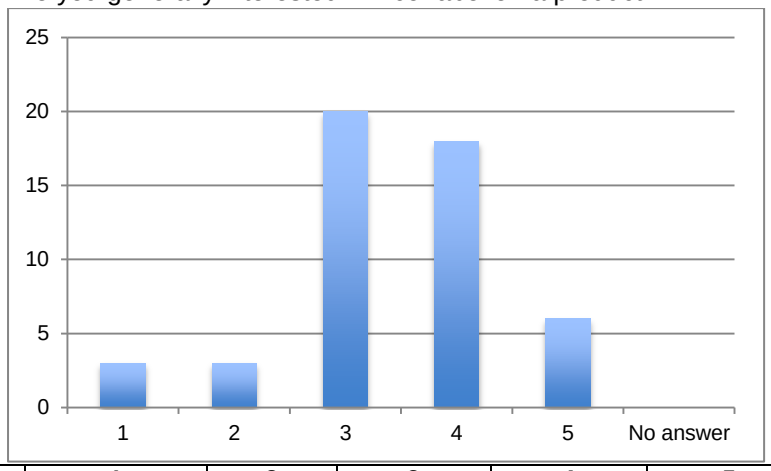
- Consumers



	1 Not responsible	2	3	4	5 Most responsi-ble	No answer
Amount	0	2	10	21	17	0
Percent	0%	4%	20%	42%	34%	0%

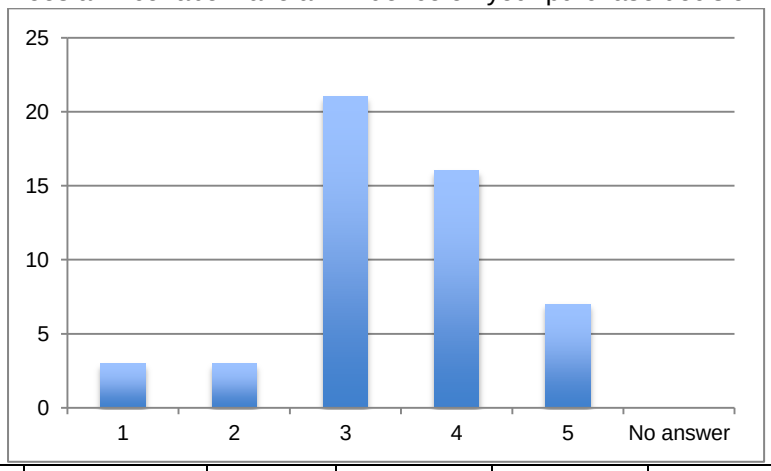
3 Product Water Footprint Label

3.1 Are you generally interested in Eco-label on a product?



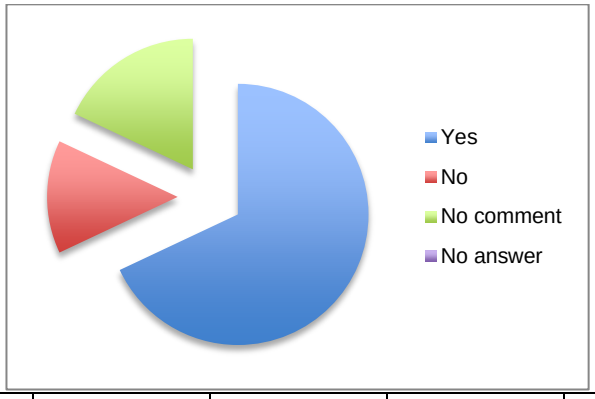
	1 Least	2	3	4	5 Most	No answer
Amount	3	3	20	18	6	0
Percent	6%	6%	40%	36%	12%	0%

3.2 Does an Eco-label have an influence on your purchase decision?



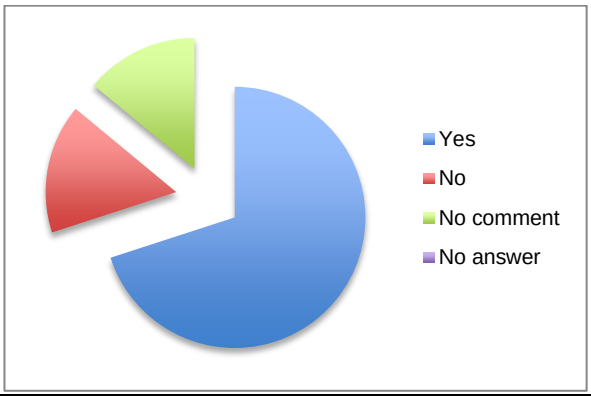
	1 Least	2	3	4	5 Most	No answer
Amount	3	3	21	16	7	0
Percent	6%	6%	42%	32%	14%	0%

3.3 A Water Footprint labeled product shows that the producer has already improved/adapted/developed its production process to use less water



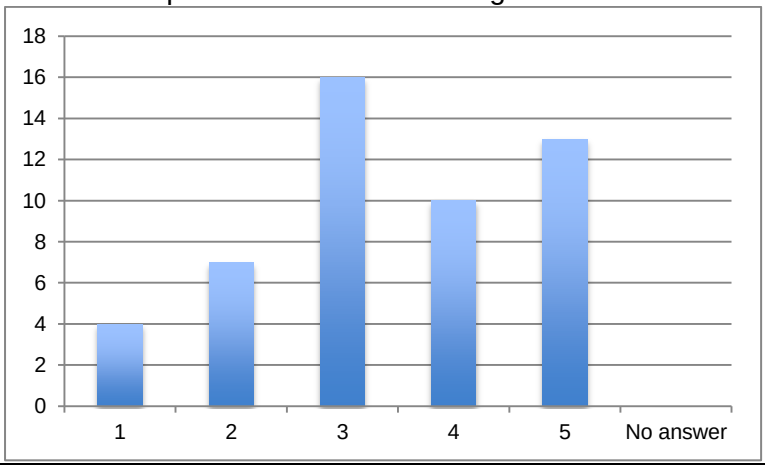
	Yes	No	No comment	No answer
Amount	34	7	9	0
Percent	68%	14%	18%	0%

3.4 A Water Footprint labeled product shows that the producer has the social responsibility by using less water in its production process.



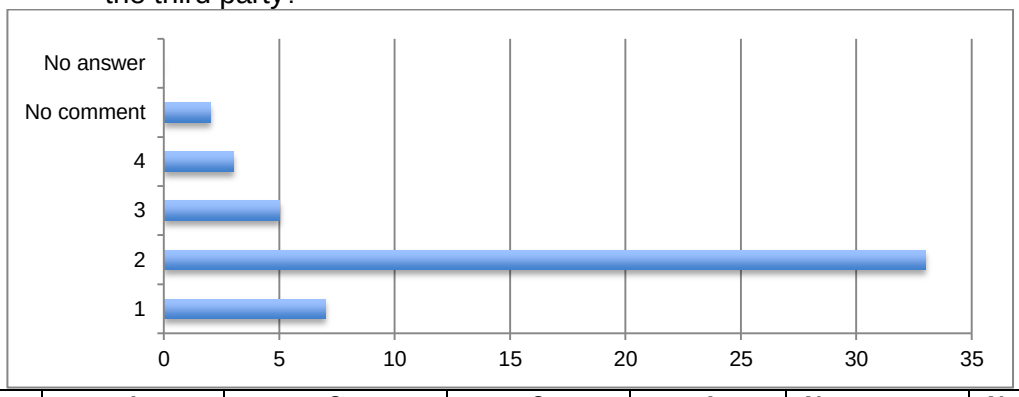
	Yes	No	No comment	No answer
Amount	35	8	7	0
Percent	70%	16%	14%	0%

3.5 Do you think that the quality of a Water Footprint labeled product is better than non-labeled products in the same range?



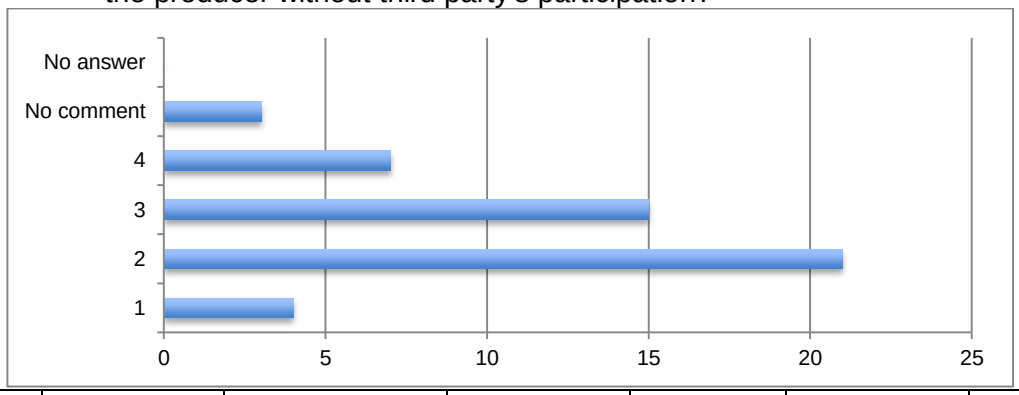
	1 Disagree	2	3	4	5 Agree	No answer
Amount	4	7	16	10	13	0
Percent	8%	14%	32%	20%	26%	0%

3.6 Is a Water Footprint label trustworthy, if it is put forward and is controlled by the third party?



	1 Definitely	2 To some extent	3 No, hardly	4 Not at all	No comment	No answer
Amount	7	33	5	3	2	0
Percent	14%	66%	10%	6%	4%	0%

3.7 Is a Water Footprint label trustworthy, if it is put forward and is controlled by the producer without third party's participation?

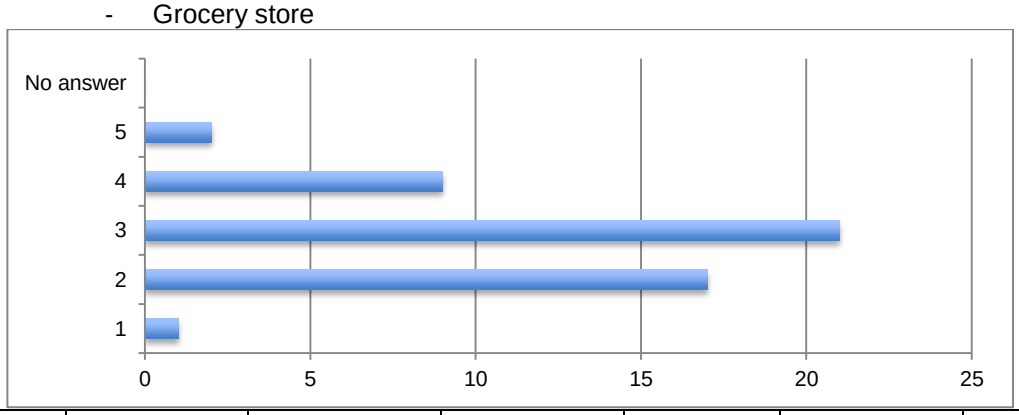


	1 Definitely	2 To some extent	3 No, hardly	4 Not at all	No comment	No answer
Amount	4	21	15	7	3	0
Percent	8%	42%	30%	14%	6%	0%

4 The role of consumer in supporting the Product Water Footprint Labeling

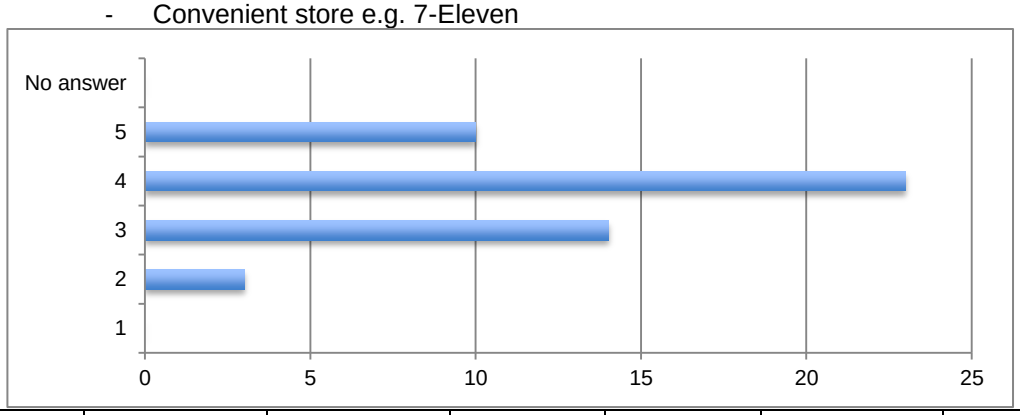
4.1 Please assess how often do you buy food and beverage products from the following options.

- Grocery store



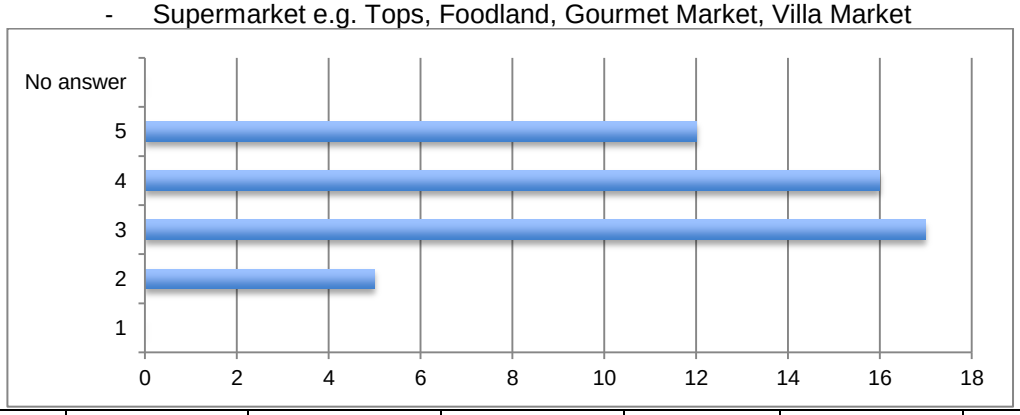
	1 Never	2	3	4	5 Always	No answer
Amount	1	17	21	9	2	0
Percent	2%	34%	42%	18%	4%	0%

- Convenient store e.g. 7-Eleven



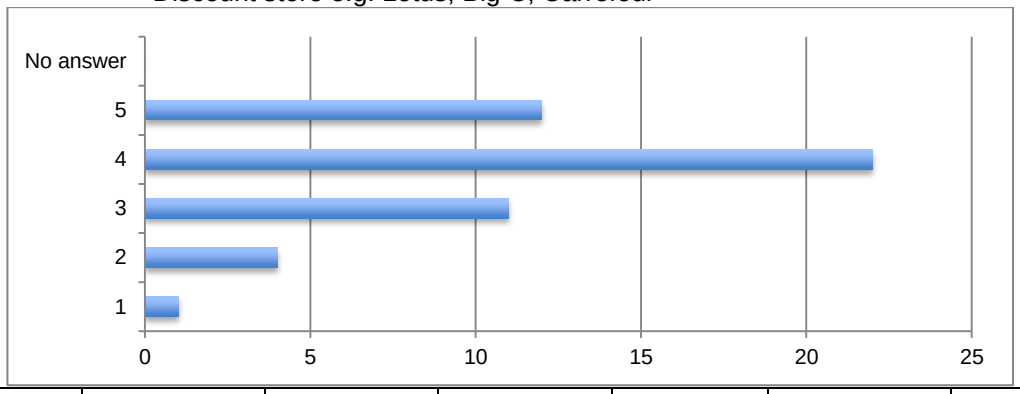
	1 Never	2	3	4	5 Always	No answer
Amount	0	3	14	23	10	0
Percent	0%	6%	28%	46%	20%	0%

- Supermarket e.g. Tops, Foodland, Gourmet Market, Villa Market



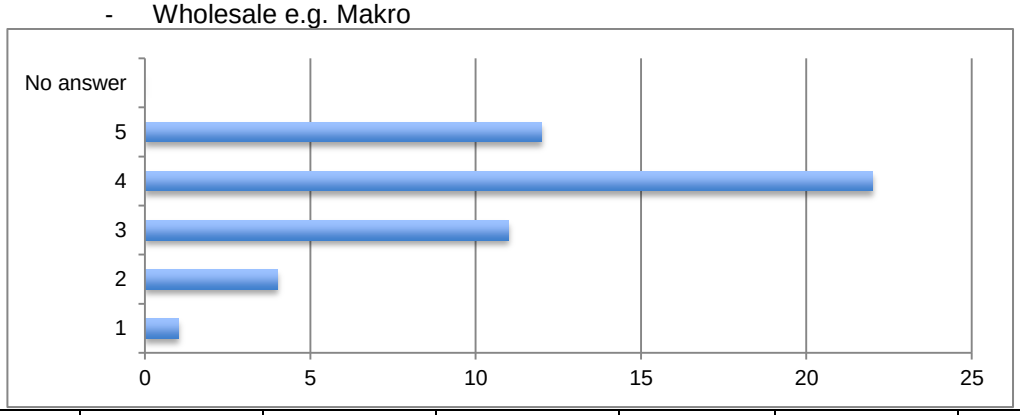
	1 Never	2	3	4	5 Always	No answer
Amount	0	5	17	16	12	0
Percent	0%	10%	34%	32%	24%	0%

- Discount store e.g. Lotus, Big C, Carrefour



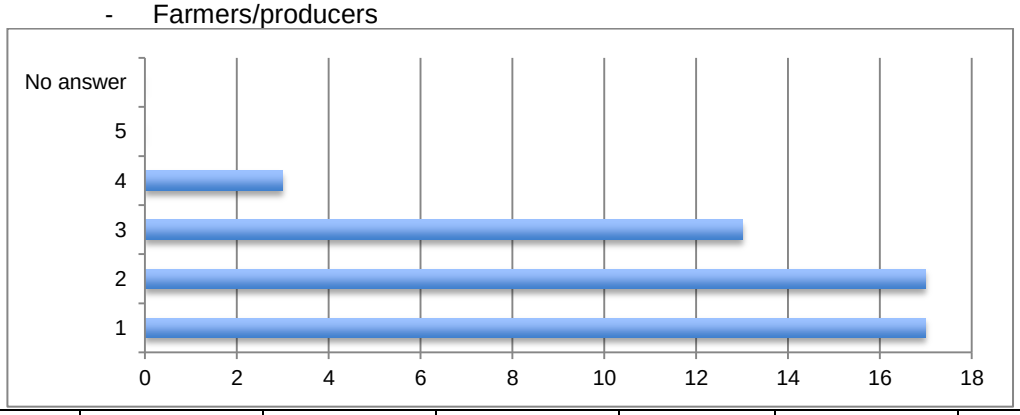
	1 Never	2	3	4	5 Always	No answer
Amount	1	4	11	22	12	0
Percent	2%	8%	22%	44%	24%	0%

- Wholesale e.g. Makro



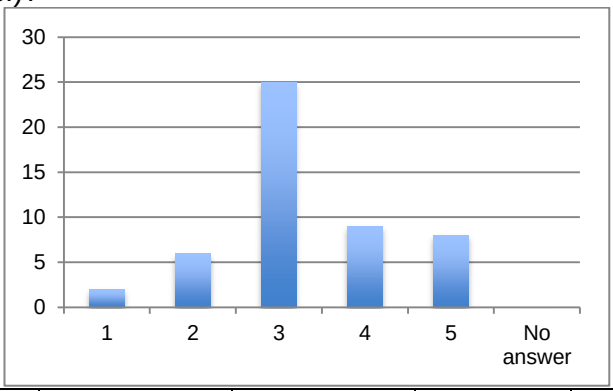
	1 Never	2	3	4	5 Always	No answer
Amount	1	4	11	22	12	0
Percent	2%	8%	22%	44%	24%	0%

- Farmers/producers



	1 Never	2	3	4	5 Always	No answer
Amount	17	17	13	3	0	0
Percent	34%	34%	26%	6%	0%	0%

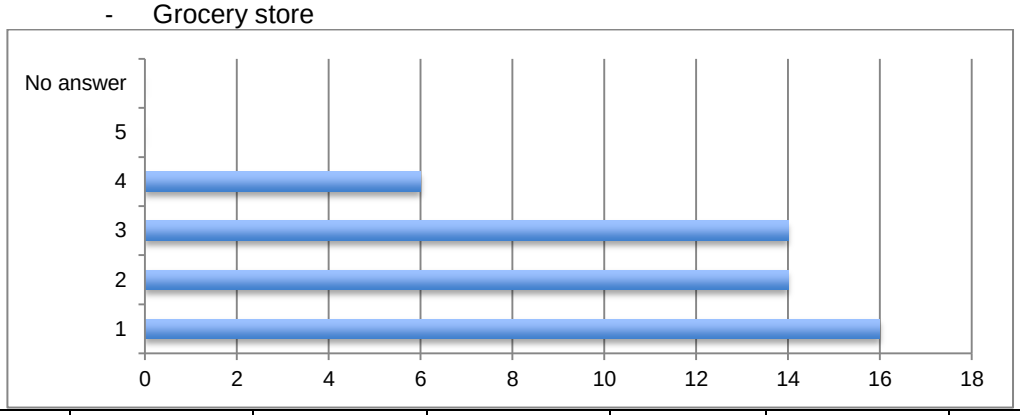
4.2 How often do you buy products with environmental labels (green label, carbon label etc.)?



	1 Never	2	3	4	5 Always	No answer
Amount	2	6	25	9	8	0
Percent	4%	12%	50%	18%	16%	0%

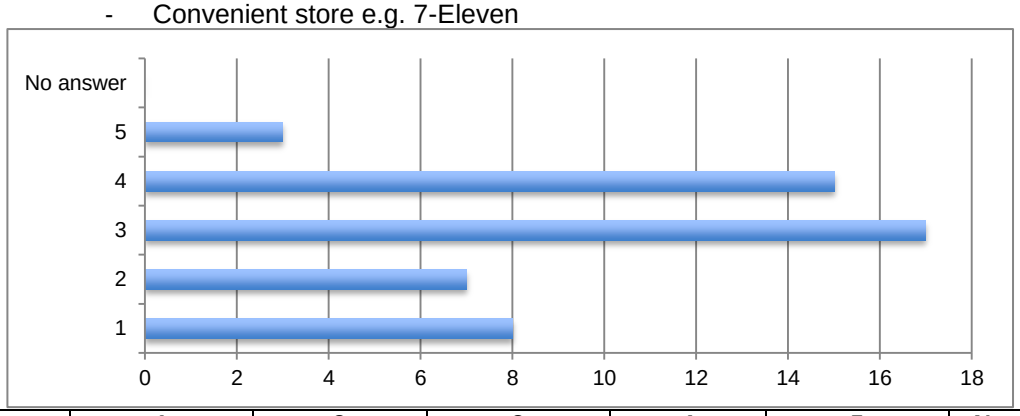
4.3 Please assess how often do you buy Eco-labeled food and beverage products from the following options.

- Grocery store



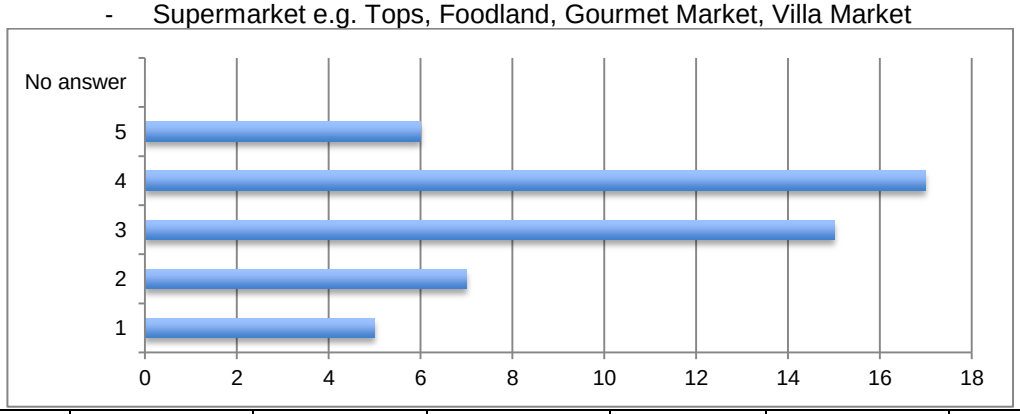
	1 Never	2	3	4	5 Always	No answer
Amount	16	14	14	6	0	0
Percent	32%	28%	28%	12%	0%	0%

- Convenient store e.g. 7-Eleven



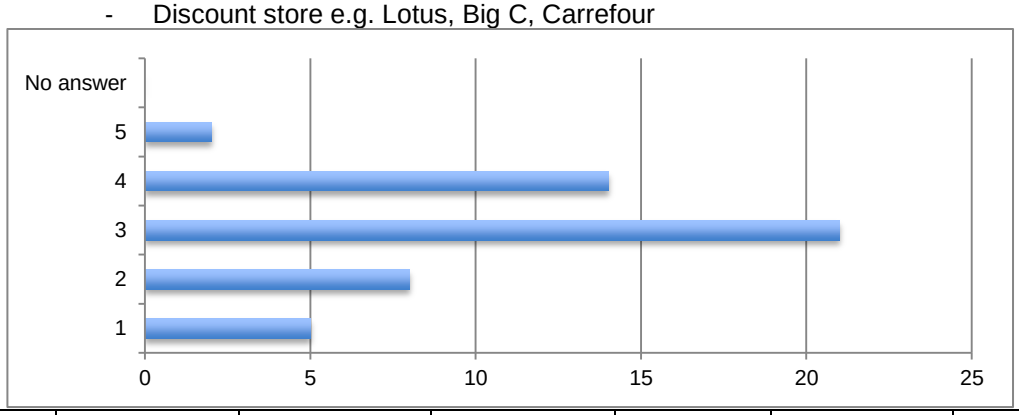
	1 Never	2	3	4	5 Always	No answer
Amount	8	7	17	15	3	0
Percent	16%	14%	34%	30%	6%	0%

- Supermarket e.g. Tops, Foodland, Gourmet Market, Villa Market



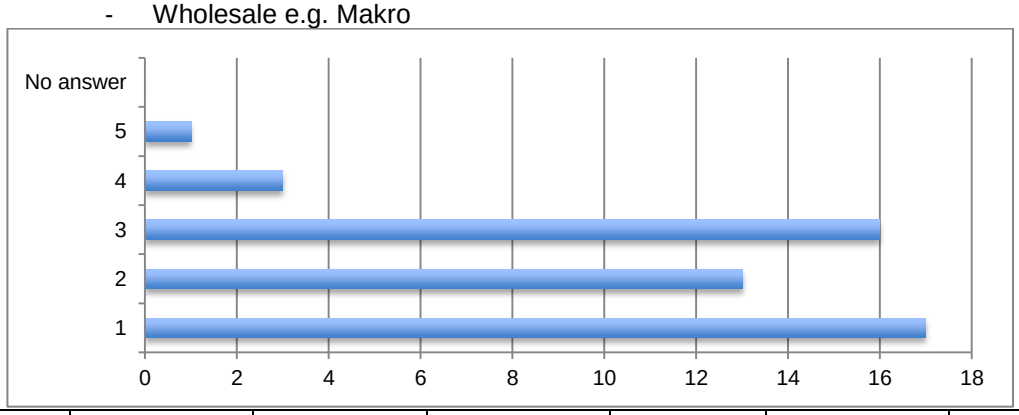
	1 Never	2	3	4	5 Always	No answer
Amount	5	7	15	17	6	0
Percent	10%	14%	30%	34%	12%	0%

- Discount store e.g. Lotus, Big C, Carrefour



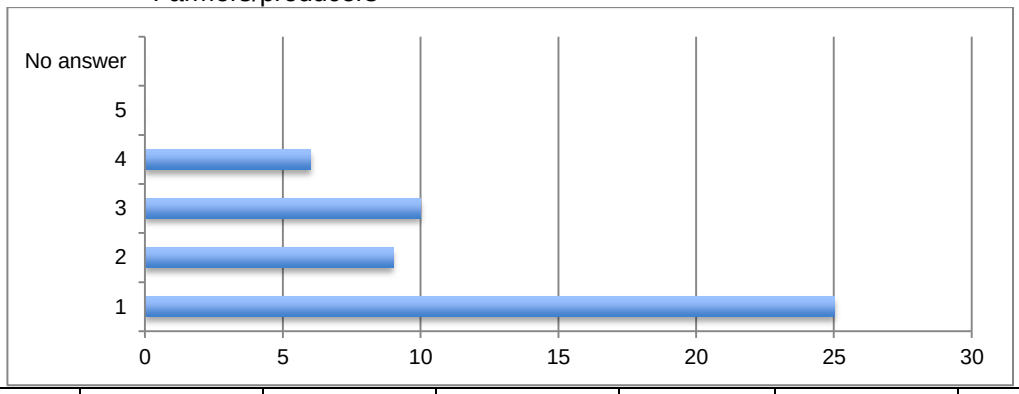
	1 Never	2	3	4	5 Always	No answer
Amount	5	8	21	14	2	0
Percent	10%	16%	42%	28%	4%	0%

- Wholesale e.g. Makro



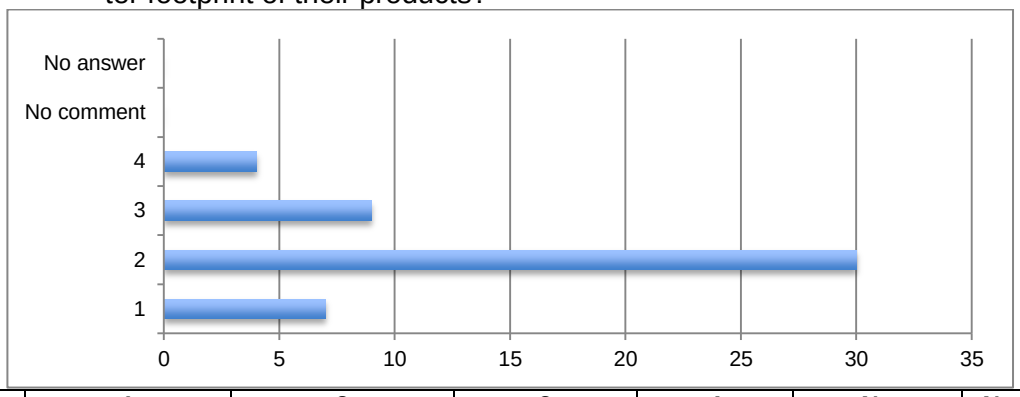
	1 Never	2	3	4	5 Always	No answer
Amount	17	13	16	3	1	0
Percent	34%	26%	32%	6%	2%	0%

- Farmers/producers



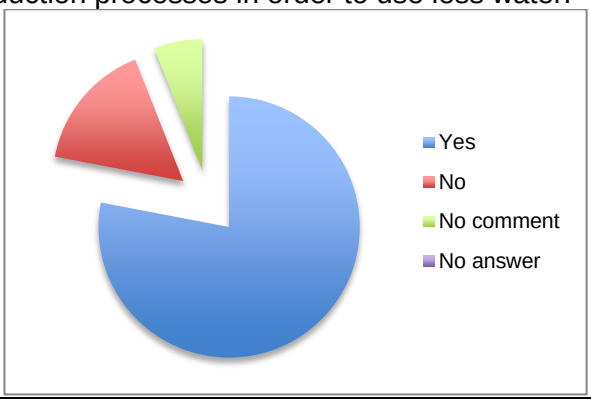
	1 Never	2	3	4	5 Always	No answer
Amount	25	9	10	6	0	0
Percent	50%	18%	20%	12%	0%	0%

4.4 Do you as a consumer can influence producers to make them display the water footprint of their products?



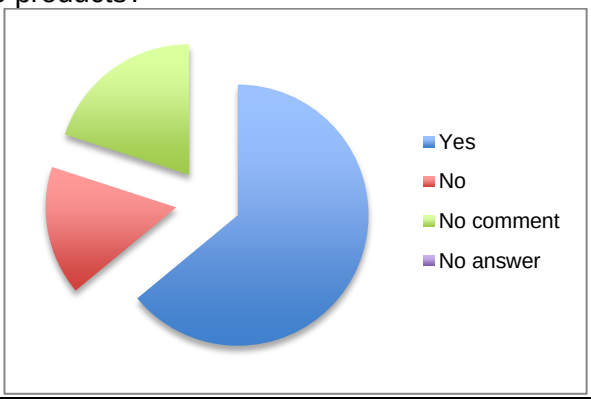
	1 Yes Absolutely	2 To some extent	3 No, hardly	4 Not at all	No comment	No answer
Amount	7	30	9	4	0	0
Percent	14%	60%	18%	8%	0%	0%

4.5 Do you agree? By purchasing water footprint labeled products you (as a consumer) can contribute to reduce water problems, because producers improve their production processes in order to use less water.



	Yes	No	No comment	No answer
Amount	39	8	3	0
Percent	78%	16%	6%	0%

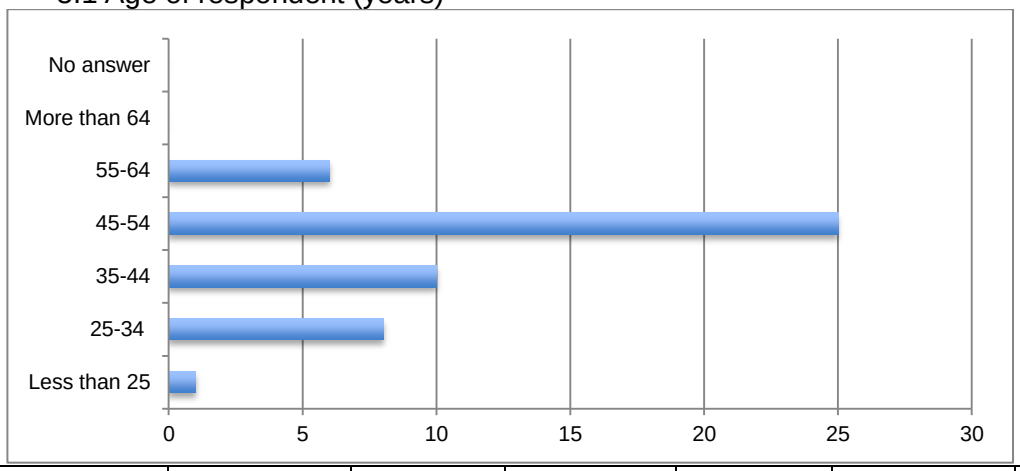
4.6 Would you recommend your friends to buy water footprint labeled food and beverage products?



	Yes	No	No comment	No answer
Amount	32	8	10	0
Percent	64%	16%	20%	0%

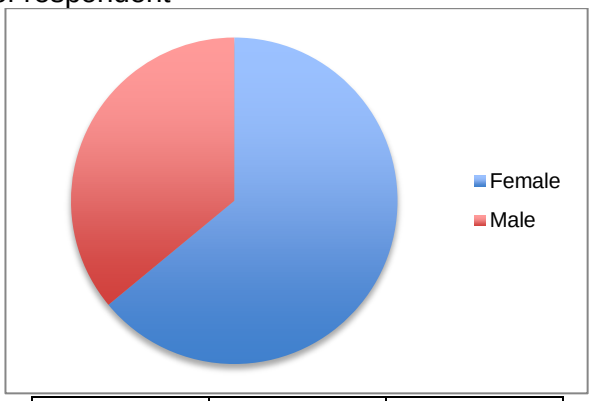
5 General information of respondent

5.1 Age of respondent (years)



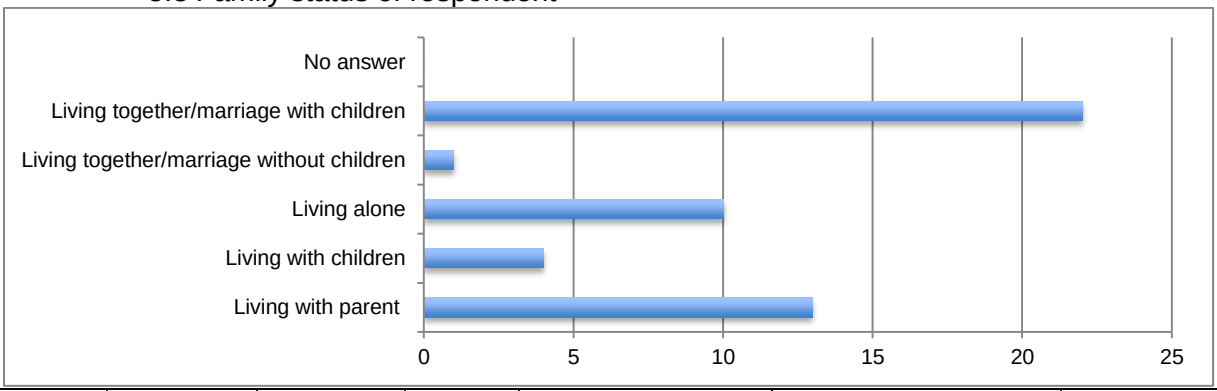
	Less than 25	25-34	35-44	45-54	55-64	More than 64	No answer
Amount	1	8	10	25	6	0	0
Percent	2%	16%	20%	50%	12%	0%	0%

5.2 Gender of respondent



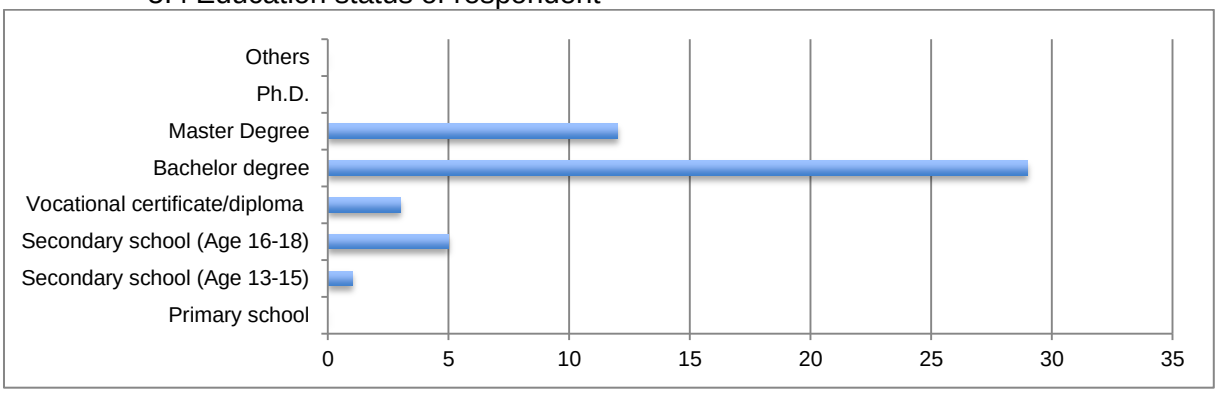
	Female	Male
Amount	32	18
Percent	64%	36%

5.3 Family status of respondent



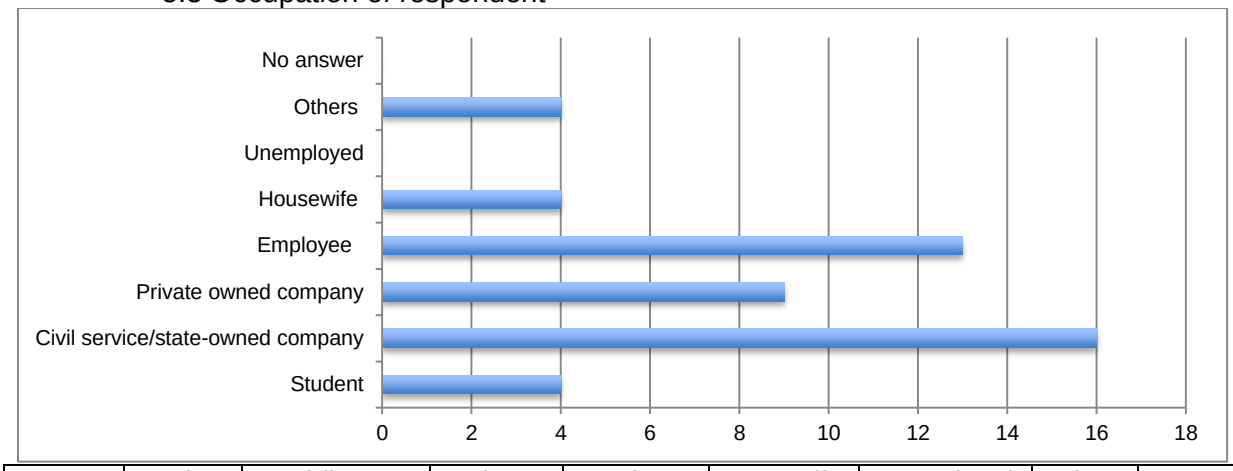
	Living with parent	Living with children	Living alone	Living togeth-er/marriage without children	Living together/marriage with children	No answer
Amount	13	4	10	1	22	0
Percent	26%	8%	20%	2%	44%	0%

5.4 Education status of respondent



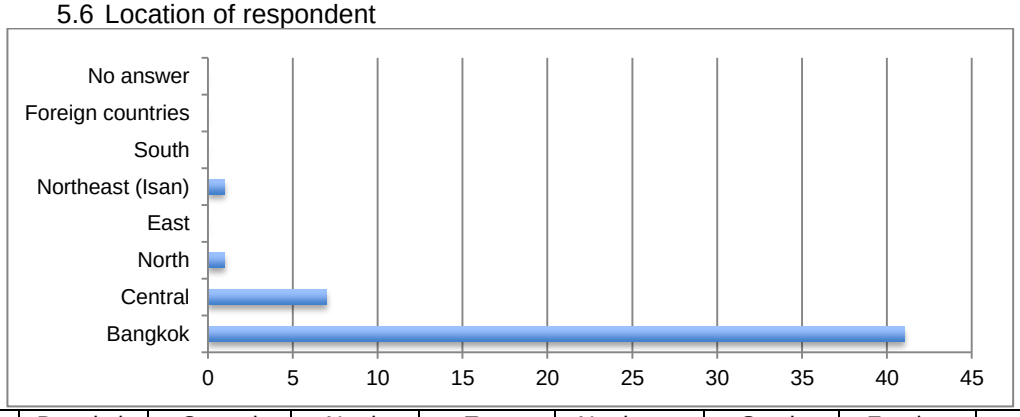
	Primary school	**Secondary school (Age 13-15)**	**Secondary school (Age 16-18)**	**Vocational certifi-cate/diploma**	**Bachelor degree**	**Master Degree**	**Ph.D.**	**Others**
Amount	0	1	5	3	29	12	0	0
Percent	0%	2%	10%	6%	58%	24%	0%	0%

5.5 Occupation of respondent



	Student	Civil ser-vice/state-owned com-pany	Private owned company	Employee	Housewife	Unemployed	Others	No answer
Amount	4	16	9	13	4	0	4	0
Percent	8%	32%	18%	26%	8%	0%	8%	0%

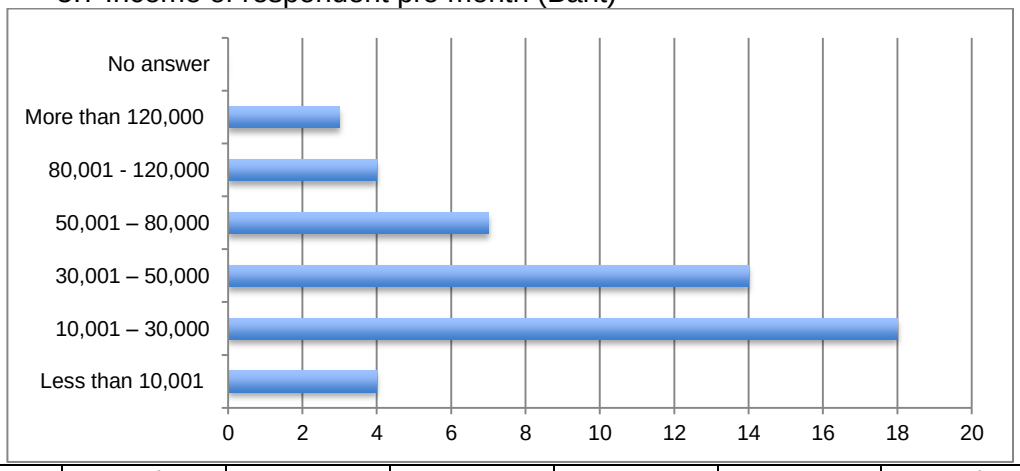
5.6 Location of respondent



	Bangkok	Central	North	East	Northeast (Isan)	South	Foreign countries	No answer
Amount	41	7	1	0	1	0	0	0
Percent	82%	14%	2%	0%	2%	0%	0%	0%

- Central of Thailand includes , Samut Prakan (1), Nonthaburi (2), Pathum Thani (4).
- North of Thailand includes Chiang Rai (1).
- Northeast of Thailand includes Sakon Nakhon (1).

5.7 Income of respondent pro month (Baht)



	Less than 10,001	10,001 – 30,000	30,001 – 50,000	50,001 – 80,000	80,001 - 120,000	More than 120,000	No answer
Amount	4	18	14	7	4	3	0
Percent	8%	36%	28%	14%	8%	6%	0%

1.4 Qualitative Feedback (Thai)

Internet-based survey questionnaire

1.2 Why?

Type A

1. เข้าใจง่ายที่สุด
2. เห็นว่ารูปหยดน้ำและรูปโลกสื่อสารข้อมูลที่ต้องการ
   จะสื่อได้ดีและดูเป็นจริงเป็นจังมากกว่ารูปรอยเท้าซึ่งดูสร้างสรรค์และปลุกจิตสำนึก ได้น้อยกว่า
   และการแจ้งจำนวนการใช้น้ำเชิงเปรียบเทียบกับค่าเฉลี่ยก็ช่วยให้ผู้บริโภคเข้าใจได้ง่ายขึ้น
   เห็นความแตกต่างชัดเจนขึ้น ทั้งนี้ ในภาพรวมของผู้บริโภคทุกระดับ
3. น่าจะสื่อกับผู้บริโภคได้ดีกว่า แต่เรื่อง water footprint นี้ต้องมีการประชาสัมพันธ์ในวงกว้าง
   ให้คนเห็นความสำคัญกัน และให้เข้าใจว่าคืออะไรครับ
4. เพราะได้รู้ว่า ปริมาณน้ำที่ใช้เป็นเท่าไหร่-จากค่าเฉลี่ยเท่าไหร่
   รูปหยดน้ำดูจะสื่อความหมายได้ดีกว่ารูปรอยเท้า
5. ง่ายต่อความเข้าใจและภาพสื่อให้เห็นว่าทำเพื่อโลกใบนี้
6. ชอบรูปหยดน้ำที่มีลูกโลกด้านใน เพราะว่าให้อารมณ์อนุรักษ์ดีค่ะ
   ชอบการเขียนค่าการใช้น้ำเต็มๆ คือ เขียนว่าตอนนี้ใช้เท่าไร และการใช้เดิมเท่าไร
   เพราะทำให้รู้ว่าเราใช้กันจริงๆเป็นจำนวนเท่าไรค่ะ
7. The water drop is more suitable in my opinion and actually, you can also add the per-centage on the drop.
8. การเลือกปริมาณน้ำที่ใช้ในกระบวนการผลิตทั้งหมด เปรียบเทียบกับปริมาณน้ำใช้เฉลี่ย
   จะทำให้เห็นภาพรวมของการใช้น้ำได้ดีกว่า
9. และระบุเพิ่มด้วยว่าได้ประหยัดน้ำ 11.8% โดยไม่ใช้เครื่องหมายลบ
10. ในด้านการใช้สัญลักษณ์
    - ทำให้ผู้บริโภคเข้าใจในสัญลักษณ์ นั่นคือ ลดการใช้น้ำเพื่อโลกของเรา (Save water for save world)
    ในด้านการแสดงค่าการใช้น้ำ
    - ผู้บริโภคสามารถทราบค่าเฉลี่ยที่ใช้ในการผลิตสินค้าชนิดนั้น และค่าการใช้น้ำที่ลดลงได้
    ซึ่งถ้าค่ายิ่งต่างกันมาก นั่นหมายถึง
    ผู้ผลิตเอาใจใส่ในการนำน้ำที่มีอยู่อย่างจำกัดมาใช้ในการผลิตสินค้า
11. 3000l เข้าใจง่ายกว่า หยดน้ำดูสุภาพกว่า
12. เข้าใจง่าย และไม่ชอบให้มีรูปเท้าบนบรรจุภัณฑ์

13. เพื่อให้ผู้บริโภคมีโอกาสตัดสินใจเลือกสินค้าจากปริมาณน้ำที่ใช้ในการผลิต
เพื่อมุ่งหวังให้ผู้บริโภคมีส่วนร่วมในการใช้น้ำ อย่างมีประสิทธิภาพ
14. หยดน้ำสื่อดีกว่าและสุภาพกว่า
รวมทั้งเพื่อให้ผู้บริโภคคำนึงถึงโลกในภาพใหญ่...โดยค่าเฉลี่ยอยู่ที่ 3,400 l/kg
ซึ่งเห็นชัดเจนมากกว่าเปอร์เซนต์
15. ละเอียดชัดเจนมากกว่า
16. ภาพหยดน้ำสื่อความเข้าใจได้ดีกว่า ต้องการให้แสดงทั้งตัวเลขที่ใช้และค่าเฉลี่ย
เพื่อสามารถเปรียบได้
17. เพื่อให้รู้ถึงการใช้ไปและมาตรฐานที่ตั้งไว้
เป็นการเปรียบเทียบให้เห็นถึงประสิทธิภาพในกระบวนการผลิต ที่มีการใช้น้ำน้อยลง
เมื่อผู้บริโภคได้เห็นถึงตัวเลขที่ลดลง ก็จะทำให้เกิดการตัดสินใจซื้อสินค้าได้ง่ายขึ้น
ส่วนฉลาก ที่ใช้เป็นหยดน้ำน่าจะดีกว่า เพราะโดยส่วนมากแล้วสินค้าที่ติดฉลาก Water Foot-print เป็นผลิตภัณฑ์เกี่ยวกับ อาหารและเครื่องดื่ม
18. คนยังไม่เข้าใจวัตถุประสงค์อีกมาก จึงควรใส่รายละเอียดเท่าที่มากได้ลงไปก่อน
19. สวยและเข้าใจง่าย
20. ชัดเจน
21. เพราะเห็นปริมาตรน้ำที่ถูกใช้ไปจริงเป็นจำนวนเท่าไร
22. เห็นตัวเลขแล้วเข้าใจ ทราบเลย ไม่ต้องคิดมาก

Type B

1. รูปเท้าตรงกับคำจำกัดความ ไปกันได้ดีกับการก้าวเดินต่อไปค่ะ เรื่องตัวเลข
เห็นความต่างในภาพรวมได้ชัดเจน
2. (1) รอยเท้ารูปหยดน้ำ แสดงถึงคำว่า water footprint
ในขณะที่รูปลูกโลกสื่อถึงการประหยัดน้ำเพื่อโลก แต่ไม่ดึงดูดความสนใจเท่ารูปหยดน้ำ
(2) แบบ 3,000 l/kg เป็นการบอกตัวเลขเต็ม หากผู้บริโภคต้องการเปรียบเทียบ
ก็ควรจะลบเอง ถ้าไปลบเลย อาจทำให้เข้าใจผิดได้
3. เข้าใจง่าย

Type C

1. มันง่ายที่จะเข้าใจว่าเราสามารถประหยัดน้ำไปได้เป็นจำนวนเท่าไหร่จากการซื้อผลิตภัณฑ์นี้ โดยไม่ต้องคิดคำนวณบวกลบ
2. เป็นเครื่องหมายที่เข้าใจได้ง่าย
   สามารถมองเห็นได้อย่างชัดเจนว่าเราประหยัดทรัพยากรน้ำให้โลกได้เท่าไหร่
3. -400 เห็นภาพชัดเจนกว่าว่าลดได้เป็นปริมาณเท่าไหร่ และถ้ามี % กำกับคู่กันด้วยจะดีมาก เพราะ % มันนำเสนอภาพอีกมุมมองนึง ดูตัวอย่างจากใน supermarket หรือ amazon
   เค้าจะกำกับทั้งจำนวนเงินที่ลดไปและ % ที่ลดราคาอ่ะ
4. โดยส่วนตัวถือเรื่องเอาเท้ามาไว้บนของกิน แม้ว่าจริงๆแล้วรูปเท้าทำได้สวยกว่า
   เลือกแบบที่ลบให้เลย จะได้ไม่ต้องลบเอง อันที่เป็น เปอร์เซนต์ก็ดี แต่น่าจะมีค่าดิบไว้ด้วย
5. เพราะการแสดงผลในแบบแรกมีจำนวนตัวเลขที่ละเอียด แต่ผู้บริโภค (โดยเฉพาะคนไทย) อาจจะต้องการการอ่านข้อมูลที่รวดเร็ว และกระชับ จึงควรเลือกในแบบที่แนะนำ
   ซึ่งตอบตรงจุดว่าลดการใช้น้ำลงไปเท่าไหร่
6. แสดงมูลค่าที่ลดได้เลย โดยไม่ต้องคำนวณต่อว่าประหยัดได้เท่าไร
7. แสดงให้เห็นถึงค่าของน้ำที่ลดจากการใช้ได้จริง
   และนำเสนอให้ชัดเจนในรูปหยดน้ำก็จะสุภาพน่ามองกว่าค่ะ
8. เลือกแบบ "หยดน้ำ" เพราะไม่ชอบรูปรอยเท้าที่ส่วนใหญ่มักสื่อความหมายไม่ค่อยดีนัก (มีแบบอื่นๆอีกมั้ยอ่ะ??) เลือกแสดงส่วนต่างที่ลดลง
   เนื่องจากสื่อออกได้ชัดเจนกว่าว่าช่วยลดการใช้น้ำได้เท่าไหร่
   (ความจริงอยากให้ใส่เปอร์เซ็นต์ไว้ด้วยจัง)
9. เพราะค่าที่ลดลงอย่างชัดเจน
10. เพราะเป็นข้อมูลดิบ ไม่ต้องคำนวนอีกแล้ว
    และสามารถคำนวนคร่าวๆได้ว่าประหยัดไปกี่เปอร์เซ็นต์
11. สื่อถึงการใช้น้ำเป็นองค์ประกอบของผลิตภัณฑ์ที่ลดลง

Type D

1. แบบ % มันหลอกตาผู้บริโภคได้ง่าย เพราะถ้าค่าเฉลี่ยการใช้น้ำต่ำลดการใช้เพียงนิดเดียว % มันจะดูสูง แบบบอกจำนวนที่ลดดีกว่า แบบบอกจำนวนทั้งหมดเพราะประหยัดเวลาคิดของผู้ซื้อ แนะนำว่าไม่ควรมีติดลบ เพราะเครื่องหมายลบมักจะสร้างความรู้สึก ทางด้านลบต่อตัวสินค้า
2. (1) Absolute number ที่ลดลง น่าจะเป็นตัวเลขที่ Present ความใส่ใจของผู้ผลิตสู่ผู้บริโภคได้แรงที่สุด และสื่อได้แบบเห็นปุ๊บรู้ปั๊บ
   (2) เลือกรอยเท้า เพราะส่วนมากที่เคยเห็นสัญลักษณ์ Carbon footprint ก็จะเป็นรูปแนวนี้ ซึ่งสองอันนี้น่าจะเป็นไปในทางเดียวกัน ถ้าหากในอนาคต Product ต่างๆ ต้องมีการติด footprint ทั้งสองอย่างนี้บนฉลาก
3. เนื่องจากเป็นการแสดงให้เห็นว่า สามารถประหยัดการใช้น้ำเมื่อเทียบกับเดิมได้เท่าไร หากเป็นการแสดงปริมาณโดยรวมทั้งหมด จะต้อง Benchmark กับสินค้าประเภทเดียวกัน แต่หากเป็นการประหยัด ก็คือการทำให้ดีขึ้น โดยส่วนตัวบางผลิตภัณฑ์อาจจะยากที่จะทำการ Benchmark เนื่องจากมีข้อจำกัดเดิมของโรงงานอยู่แล้ว และอาจจะนำมาซึ่งปัญหาทางด้านการค้าขาย แต่หากเป็นการประหยัด และทำค่อยๆเป็นค่อยๆไปอย่างต่อเนื่อง น่าจะเป็นสิ่งที่ดีกว่า

Type E

1. เพื่อจะได้เห็นการลดลงของการใช้น้ำว่ามีปริมาณมากน้อยเท่าใดเมื่อเทียบเป็นเปอร์เซนต์ โดยไม่ว่าผลิตภัณฑ์นั้นๆจะมีขนาดเท่าใดก็จะ เข้าใจได้ว่ามีการลดลงมากหรือน้อย และยังสามารถนำไปเปรียบเทียบกับผลิตภัณฑ์ต่างขนาดกันได้ด้วย
2. เข้าใจง่าย มองเห็นภาพชัดถึงการประหยัดน้ำได้
3. ให้ความรู้สึกว่าต้องรักษ์โลก ดูแลโลก เพื่อประโยชน์ต่อส่วนรวม
4. การแสดงในรูปแบบร้อยละที่ลดลง สามารถสื่อความหมายได้ชัดเจนและผู้บริโภคเข้าใจง่ายกว่า
5. เหตุผลแรกคือเลือกเป็นรูปหยดน้ำก่อน เพราะคิดว่ามีความเหมาะสมมากกว่าการใช้รูปรอยเท้าบนฉลากอาหาร เหตุผลที่สองคือเลือกเป็นเปอร์เซ็นต์ มีความหมายมากกว่าเป็นตัวเลข เนื่องจากมีค่าอ้างอิงที่แน่นอน การใช้แต่ตัวเลขอาจทำให้เป็น การบิดเบือนความหมายนัยสำคัญได้
6. อ่านง่าย
7. เห็นชัดเจนถึงการเปลี่ยนแปลงดี แต่ว่าน่าจะมีค่าเฉลี่ยให้ด้วยนะ
8. รูปแบบตัวเลขดูเข้าใจง่าย เมื่อนำเสนอเป็นเปอร์เซ็นต์ รูปแบบฉลาก หากมีโลโก้รูปเท้าปรากฏอยู่บนอาหารคงจะดูไม่น่ากินค่ะ

9. มองเป็น % จะดูง่าย ตัวเลขน้อยและรูปรอยเท้าไม่เหมาะแน่ๆ
เพราะยิ่งอยู่บนสินค้าประเภทอาหารด้วยแล้วไม่น่าดึงดูด
10. รอยเท้ามันดู negative สำหรับคนเอเชีย ใช้ตัวเลขที่แสดงการเปรียบเทียบมันเข้าใจง่ายกว่า
11. ผมชอบรูปนี้นะ
12. Footprint น่าจะหมายถึงโลโก้
ที่สามารถทำให้ผู้บริโภคมองเห็นถึงผลิตภัณฑ์ตัวนั้นในเชิงบวกและบอกค่าได้ชัดเจน
สัญลักษณ์หยดน้ำกับ
เครื่องหมายลบแสดงเป็นร้อยละของผลิตภัณฑ์ที่สามารถใช้น้ำลดลงในกระบวนการผลิตเป็นสิ่งดี
ไม่ควรใช้รูปเท้าเลยค่ะ แม้จะสื่อตรงๆ แต่ติดเป็นสัญลักษณ์เชิงลบไม่เหมาะสมด้วยทุกประการ
13. อ่านง่าย
14. ชัดเจน เข้าใจง่าย
15. EASY TO UNDERSTAND.
16. ตัวเลขเปอร์เซนต์ให้ความหมายอย่างมีนัยยะมากกว่าในการรับรู้
17. ในแง่ผู้บริโภค แบบนี้จะดีกับผู้บริโภคที่จะเปรียบเทียบได้ง่าย
ชัดเจนเวลาดูข้อมูลสินค้าเพื่อเปรียบเทียบกัน เพราะความเป็นจริงผู้บริโภค ไม่ต้องการรู้ลึกมากว่า
สินค้าอันใดใช้น้ำเท่าไหร่
ต้องการรู้แค่เพียงจำนวนเปอร์เซ็นต์ที่ผู้ผลิตสามารถประหยัดน้ำได้น่าจะเพียงพอ
อันนี้เป็นความคิดเห็นส่วนตัวของพี่นะน้อง ส่วนรูปนี่ พี่ชอบรูปที่เป็นหยดน้ำมากกว่า
แม้มันจะไม่ใสมองเห็นชัดก็ตามแต่มันสื่อให้เห็นถึง
ความรักษ์โลกอย่างหนึ่งมากกว่าใช้รูปเท้าอย่างบ้านเมืองเขา เรามีประเพณีวัฒนธรรม
ของบางอย่างนะเป็นของสูง ก็อาจจะไม่เหมาะนะ
เพราะรอยเท้าคนไทยเราว่าเป็นส่วนต่ำสุดในร่างกายเรานะ ดังนั้น
หยดน้ำจึงให้ความหมายในด้านบวกมากกว่าในทัศนะของพี่
18. เข้าใจมากกว่าอย่างอื่น สำหรับคนอ่าน
19. ใจจริงมีความเห็นนะครับ เลยไม่รู้จะตอบยังไง ชอบหยดน้ำ แต่อยากให้นำเสนอข้อมูลเฉลี่ยว่า
ใช้น้ำเท่าไหร่ แล้วระบุว่าผลิตภัณฑ์นี้ สามารถประหยัดน้ำลดลงได้ร้อยละเท่าไหร่
ค่าเฉลี่ยทำให้ทราบว่าอาหารนี้ใช้น้ำเท่าไหร่ เปอร์เซ็นต์ที่ลดลงทำให้ตัดสินได้ว่าผลิตภัณฑ์นี้
หรือยี่ห้อนี้ สามารถช่วยประหยัดน้ำได้เท่าไหร่
เมื่อเปรียบเทียบกับตัวอื่นและราคาที่จะต้องจ่ายเพิ่ม
20. ระบุเป็น % เข้าใจง่าย
21. สมควรเทียบอัตราการลดการใช้น้ำเป็นสัดส่วนเปรียบเทียบกับแบบเดิม
22. สามารถเข้าใจได้ง่ายๆว่าประหยัดน้ำได้กี่ % ของค่าเฉลี่ย

23. เข้าใจง่าย เห็นเป็น % จะชัดเจนในความรู้สึกของความประหยัดน้ำในการผลิต

Type F

1. Nice picture and easy to compare the number
2. คิดว่ารูปรอยเท้า water footprint สามารถสื่อความหมายได้ดีกว่า เห็นป๊ับเกตป๊ับ ทำให้รู้เลยว่ากว่าจะออกมาเป็นผลิตภัณฑ์ชิ้นนี้ได้นั้น
   กระบวนการในการใช้น้ำที่น้อยกว่าปกตินั้นมีกี่เปอร์เซ็นต์
3. สัญลักษณ์รูปเท้ามีความหมายตรงกับฉลาก Water Footprint
4. เข้าใจง่ายที่สุด
5. เข้ากับชื่อดี

No comment

1. จริงๆ ไม่ได้เห็นด้วยกับเรื่องนี้นักนะครับ
2. โลโก้ยังสื่อไม่ชัดเจน ควรจะทำโลโก้ใหม่ให้สามารถสื่อกับผู้บริโภคมากกว่านี้
   ป.ล.ควรจะแสดงเป็นเปอร์เซ็นต์ที่ลดลงเพราะง่ายแก่การเข้าใจ

1.3 - 1.6 How much do you want to pay for Water footprint labeled products?

Other

1. เท่าเดิม
2. หากฉลากนี้ทำสินค้าแพงกว่าปกติคิดว่าคนไทยคงไม่สน
3. ไม่ซื้อ
4. ไม่เห็นความแตกต่างที่จะต้องจ่ายแพงขึ้น
5. ราคาเริ่มต้นที่ 10% ของราคาเดิมคิดว่ามากไป ควรจะอยู่ที่ไม่เกิน 5%
6. ผมว่าไก่เค้าก็ต้องทานน้ำนะคับ อีกอย่างพอได้ไข่ก็ล้าง แล้วก็เอามาขายเลย
   ไม่น่าจะลดปริมาณได้แล้ว
   นมสดผมว่า วัวเค้าก็ต้องทานน้ำเยอะๆอีกนั่นแหละคับ จะไปกั๊ก ก็คงไม่ดี อีกอย่างพอรีดนมแล้วก็ต้มเสร็จก็ทานได้แล้วอ่ะคับ คือ ผมดูที่คุณภาพข้าวอ่ะคับ ถ้ามันดีเท่าไหร่ก็ซื้อ
   แต่ถ้าบอกว่าใช้น้ำน้อย ในการผลิตผมว่าเต็มที่คงซัก 200 เพราะประเทศเรามีช่วงหน้าแล้งน่าจะช่วยได้
   เหมือนไข่แหละคับ * - *
7. เราจะตรวจสอบได้อย่างไรว่าเขาประหยัดน้ำจริง มีคนไปดูหรือไม่หรือปล่อยให้เขาโมเมเอง
8. น่าจะขึ้นอยู่กับอัตราที่ลดการใช้น้ำยิ่งมากยิ่งได้ราคาสูง
9. เพราะไม่สามารถทราบถึงต้นทุนการผลิตและกระบวนการผลิตได้

10. ไม่ควรเพิ่มราคา เพราะหากทำดี คนจะซื้อมากขึ้น ท่านก็จำหน่ายสินค้าได้มากเอง
และการใช้น้ำน้อยต้องให้มีคุณภาพดีด้วย
11. ขายราคาเท่าเดิม แต่รัฐบาลให้ incentive บางอย่างกับผู้ผลิต
12. น่าจะถูกกว่าเพราะต้นทุนน้ำลดลง

2.2 Why?

Agree

1. ควรมี เพื่อให้ตระหนักถึงความสำคัญของทรัพยากรน้ำและให้ระลึกไว้ว่าน้ำอาจหมดไปได้
2. น้ำในโลกนี้มีปริมาณคงที่ไม่เพิ่ม แต่การบริโภคน้ำมีแต่จะเพิ่มขึ้นจากปริมาณประชากรที่เพิ่มขึ้น
3. ปัจจุบันเกิดภาวะโลกร้อนเพิ่มขึ้นอย่างรวดเร็ว เช่น ปริมาณฝนลดลง ไม่ตกตามฤดูกาล
เกิดภาวะแห้งแล้งเพิ่มขึ้นอย่างรวดเร็ว ฯลฯ
4. น้ำเกิดจากการเปลี่ยนสถานะทางธรรมชาติ แต่หาก factor ทางธรรมชาตินั้น
โดนจำกัดด้วยการกำจัดหรือไม่ดูแลรักษาให้ธรรมชาติที่ สมบูรณ์ยังคงอยู่ นั่นหมายถึงว่า
สิ่งที่เกี่ยวข้องกับการเกิดปฏิกิริยาทางธรรมชาติ
จะมีผลกระทบทั้งขบวนการซึ่งน้ำเป็นส่วนหนึ่งของ ทรัพยากรธรรมชาติที่โดนผลกระทบด้วย
5. เพราะน้ำจืดที่ใช้เพื่อการดำรงชีวิตมีจำกัด อีกทั้งภัยธรรมชาติ
ทำให้เกิดการขาดแคลนในหน้าแล้ง
6. ป่าไม้ที่ลดลงทำให้ฝนไม่ตกตามฤดูกาล และสังเกตจากการแย่งกันกักเก็บน้ำ เช่น
การสร้างเขื่อนของเมืองจีนทำให้แม่น้ำโขงแห้งขอด
การที่ประเทศไทยต้องซื้อน้ำดิบจากประเทศเพื่อนบ้านมาผลิตน้ำประปา
7. เป็นเรื่องจริง
8. โดยทั่วไปน้ำมีปริมาณในแต่ละพื้นที่ของโลกไม่เท่ากัน บางที่มีมาก บางที่ขาดแคลน
แต่ว่าน้ำสำหรับใช้ในการบริโภคนั้น จำเป็นต้องเป็น น้ำสะอาด
ซึ่งแหล่งที่เป็นวัตุดิบในการผลิตน้ำสะอาดจะต้องสะอาดด้วย เนื่องจากการเพิ่มขึ้นของประชากร
ทำให้มีปริมาณน้ำจำกัด เนื่องจากเกิดภาวะแห้งแล้งบ้าง เจือปนจากพิษต่างๆบ้าง เป็นต้น
9. Actually it should be "freshwater is the limited resource"
10. น้ำบนโลกที่ใช้อุปโภคบริโภคได้มีนิดเดียวเอง
11. น้ำมีอยู่มากก็จริงในโลก แต่น้ำบริสุทธิ์ที่เหมาะสำหรับการอุปโภคบริโภคของมนุษย์มีอยู่น้อยมาก
การใช้น้ำในการอุปโภคบริโภคจึงต้อง
เป็นไปอย่างจำกัดและมนุษย์จำเป็นจะต้องรู้จักการใช้น้ำอย่างมีคุณค่าให้มากที่สุด
12. น้ำที่มีอยู่มากมายคือน้ำทะเลครับ ในบนแผ่นดิน ฝนได้ตกมากมาย
แต่ก็จะไหลลงโดยผ่านการจัดเก็บที่ไม่เหมาะสม ไม่มีการจัดการที่ดีพอ

ทำให้ไหลลงทะเลได้เร็วเกิดจำเป็น ผลก็คือ หน้าฝนก็น้ำท่วม หน้าแล้งก็แล้งจัด
ทั้งๆที่มีปริมาณน้ำมากมายที่ตกกันลงมา

13. แหล่งน้ำจะแห้งไปในที่สุด
14. มันมีจำกัดจริงๆน่ะครับ :)
15. น้ำส่วนใหญ่บนโลกเป็นน้ำเค็ม แหล่งน้ำจืดที่สะอาดบริสุทธิ์พร้อมดื่มจริงๆในปัจจุบันก็หาได้ยาก
มักต้องผ่านการกรองหลายขั้นตอน หลายๆพื้นที่ของโลกยังมีปัญหาขาดแคลนน้ำ
ทั้งในทางภูมิศาสตร์ของประเทศนั้นๆและในด้านที่ประชากรไม่สัมพัทธ์กับปริมาณน้ำที่มีอยู่
16. น้ำที่พอจะใช้ได้ทั้งอุปโภคและบริโภคเริ่มมีน้อยลงไปเรื่อยๆๆ
17. เห็นด้วยเพราะ คิดว่าปัจจุบันแหล่งน้ำตามธรรมชาติเริ่มลดน้อยลงเรื่อยๆ
18. ถ้าไม่ช่วยกันรักษาหรือใช้ทรัพยากรอย่างรู้คุณค่า มันก็มีวันหมด
และเมื่อถึงวันนั้นทุกอย่างจะมีแต่ปัญหา
19. ภูมิประเทศของโลกคือคำตอบครับ
มีหลายภูมิภาคในโลกที่เป็นทะเลทรายซึ่งยากต่อการบริหารจัดการทรัพยากรน้ำ
20. A lot of places in the world are facing this problem
21. เนื่องจากแหล่งน้ำมีปริมาณจำกัด แต่จำนวนประชากรของโลกมีปริมาณเพิ่มขึ้น
กิจกรรมต่างๆในชีวิตประจำวัน กระบวนการผลิตและ กิจกรรมอื่นๆก็เพิ่มตาม
ทำให้ไม่สอดคล้องกับทรัพยากรน้ำที่มีอยู่อย่างจำกัด
ทำให้เราต้องสร้างจิตสำนึกในการใช้ทรัพยากรที่มีอยู่
อย่างจำกัดอย่างประหยัดและเกิดประโยชน์สูงสุด
22. ที่บ้านเคยน้ำไม่ไหล 1 อาทิตย์ รู้เลยว่า ถ้าขาดน้ำแล้วชีวิตต้องลำบากมากๆ
ถ้าเรารู้จักที่จะประหยัดน้ำ แล้วหาทางเก็บน้ำกักไว้ใช้ในยาม จำเป็นได้
เพื่อวันข้างหน้าในอนาตคก็จะถือว่าเป็นการช่วยโลกได้อย่างดีทีเดียว
เราไม่สามารถพึ่งพาดินฟ้าอากาศได้อย่างเดียว เราต้องพึ่ง ตนเองให้ได้ด้วย
23. ประเทศไทยหน้าแล้ง เกษตรกรขาดแคลนน้ำในการเพาะปลูกพืช
24. โลกร้อน น้ำเหลือน้อยลง ปัญหาเรื่องน้ำในฤดูแล้งรุนแรงขึ้นทุกวัน
25. เนื่องจากโลกเราประกอบไปด้วยน้ำ 2/3
แต่น้ำที่สามารถนำมาใช้ในการอุปโภคและการบริโภคได้นั้นกลับมีอยู่อย่างจำกัด ซึ่งถ้าเทียบกับ
ปริมาณประชากรที่เพิ่มขึ้นและการใช้น้ำด้วยแล้ว น้ำจืดไม่เพียงพอต่อการอุปโภคและบริโภค
ยิ่งถ้าเป็นช่วงหน้าแล้งด้วยแล้ว จะเกิดภาวะ การขาดแคลนน้ำเกิดขึ้นบ่อยครั้ง
26. น้ำจริงๆมีไม่จำกัด แต่น้ำที่จะนำมาใช้ประโยชน์มีน้อย
27. น้ำเป็นส่วนประกอบของสิ่งมีชีวิตทุกประเภท
28. น้ำจืดที่สะอาดมีจำกัด และมีการตัดไม้ทำลายป่าต้นน้ำ มีมลพิษเยอะขึ้น ทำให้ป่าต้นน้ำถูกทำลาย

29. น้ำทั่วไปมีไม่จำกัด แต่น้ำสะอาดมีอยู่จำกัด
30. หมายถึงน้ำจืดที่ใช้บริโภค กินและใช้งาน
31. เพราะน้ำบนโลกมีจำกัด โดยเฉพาะยิ่งขณะนี้มีวิกฤตการณ์โลกร้อน
ทุกสิ่งทุกอย่างมีอันเปลี่ยนแปลง
32. ถ้าใช้คำว่าจำกัดมากขึ้น จะช่วยดึงดูดผู้คนให้หันมาเห็นความสำคัญในการใช้น้ำอย่างประหยัด
เห็นคุณค่าของน้ำมากขึ้นค่ะ
33. มีคนบอกว่าน้ำจะล้นโลก แต่น้ำเป็นสิ่งจำเป็นต่อชีวิตจริงๆ
ในตอนนี้เรายังไม่เห็นความสำคัญมากนัก แต่ไม่แน่ใจว่าอนาคตจะเป็นอย่างไร
อาจมีมากจนล้นหรือแทบไม่มีเลย
34. มันก็จริงอยู่แล้วนะครับ คนขาดน้ำ น้ำทะเลเค็ม กินไม่ได้ ไม่ต้องอธิบายมากอยู่แล้วครับ
35. น้ำที่มีอยู่ในโลกนี้ถึงแม้ว่าจะมีในธรรมชาติค่อนข้างมาก (3/4 ของโลกเป็นน้ำ)
แต่มีน้ำจืดที่สามารถนำมาใช้เพื่อสินค้าเกษตรและอาหาร ได้มีปริมาณน้อย
จึงจำเป็นต้องมีการใช้น้ำอย่างมีประสิทธิภาพ
และควรมีการบริหารจัดการน้ำเพื่อให้นำมาใช้ซ้ำอย่างคุ้มค่า ก่อนเข้าสู่กระบวนการบำบัด
ซึ่งจำเป็นต้องผ่านกระบวนการที่ต้องใช้พลังงานมาก
36. เพราะปัจจุบันน้ำที่จะนำมาอุปโภคบริโภคค่อนข้างจะมีน้อย
เพราะด้วยสภาวะสิ่งแวดล้อมที่ค่อนข้างจะมีมลพิษ และภาวะโลกร้อนเป็นอีก
ปัจจัยหนึ่งที่ทำให้เป็นตัวเร่งให้น้ำมีจำกัดมากขึ้น
37. เพราะมีวันหมดไป
38. เห็นด้วย เพราะน้ำเป็นส่วนหนึ่งของทุกๆกิจกรรมในการดำรงชีวิต ภาคเกษตรกรรม
และที่สำคัญน้ำถูกใช้มากที่สุดในภาคอุตสาหกรรม โดยปราศจากการควบคุม ดูแล
และการรักษาทรัพยากรน้ำอย่างจริงจัง
จังหวัดระยองมีการใช้น้ำในกระบวนการผลิตปริมาณมาก จนถึงสภาวะขาดแคลนน้ำเมื่อ 2-3
ปีที่ผ่านมา ปัญหาดังกล่าวกระทบสู่ภาคประชาชนอย่างหลีกเลี่ยงไม่ได้
39. ถึงแม้น้ำจะเป็นส่วนประกอบหลักของโลก แต่ประกอบด้วยน้ำดี น้ำเสีย น้ำแข็ง น้ำเค็ม น้ำจืด
น้ำเน่า ฯลฯ หากไม่มีการจัดการที่ดี
จำนวนประชากรโลกที่มีอยู่มีความจำเป็นต้องใช้น้ำอย่างจำนวนมหาศาล
หากไม่มีการจัดการที่ดีทำให้เกิดการสูญเปล่า จนน้ำดีกลาย เป็นน้ำเสีย
แหล่งน้ำที่เคยมีเมื่อสามสิบปีก่อนในอดีตตื้นเขิน
จนคลองต่างๆกลายเป็นถนนหรือเป็นคลองระบายน้ำเสียไปหมดแล้ว
อนาคตหากไม่มีใครจัดการอย่างจริงจังลูกหลานจะอยู่กันอย่างไร?
40. เนื่องจากเรายังไม่สามารถบริหารจัดการวิธีกักเก็บน้ำไว้ใช้ได้อย่างมีประสิทธิภาพ

41. น้ำที่บริโภคได้มีจำกัด เพราะเสี่ยงต่อการกลายเป็นน้ำเค็มหรือการปนเปื้อนสารเคมีอื่นๆ
42. เพราะน้ำเป็นทรัพยากรที่มีวันหมดไป
และน้ำที่สามารถนำมาใช้ประโยชน์ได้มีเพียงเล็กน้อยเท่านั้น
เมื่อเทียบกับปริมาณน้ำที่มีอยู่ทั้งโลก ซึ่งส่วนมากก็เป็นน้ำเค็ม ดังนั้นการใช้น้ำที่มีอยู่อย่างจำกัด
ให้มีประสิทธิภาพสูงสุด จะช่วยให้คนรุ่นต่อไปได้มีน้ำใช้อย่างพอเพียง
43. ทรัพยากรทุกอย่างในโลกนี้ล้วนมีอยู่อย่างจำกัดทั้งนั้นแหละ
44. ขอเพิ่มเป็นน้ำ"จืด"มีอยู่จำกัดได้มั้ย? เพราะน้ำทะเลในปัจจุบันมีมากมาย
แต่ไม่สามารถนำมาใช้ประโยชน์ได้
45. We see people lack of it.
46 .เพราะประเทศไทยจะประสบปัญหาขาดแคลนน้ำในฤดูแล้งและมีผลกระทบอย่างม
ากต่อภาคเกษตรที่เป็นสินค้าส่งออกที่สำคัญ ของประเทศ
47. ถ้ามองผิวเผิน หลายคนอาจมองว่าโลกเรามีน้ำเหลือเฟือ (3 ใน 4 ส่วนของโลก)
แต่ต้องไม่ลืมว่าปัญหาภัยแล้งมีให้เห็นอยู่ตลอดเวลา นี่เองที่แสดงให้เห็นว่า
น้ำเป็นทรัพยากรที่มีอยู่อย่างจำกัด (หากไม่มีการบริหารจัดการที่ดีพอ)
48. น้ำมาจากธรรมชาติ ธรรมชาติแปรปรวนไม่แน่นอน จึงเกิดภัยแล้งขึ้น
49. ใช่ เพราะมีข่าวนาข้าวขาดน้ำตายบ่อยๆ
50. เพราะสถานการณ์ปัจจุบัน ธรรมชาติไม่สมดุล แหล่งน้ำตามธรรมชาติเริ่มลดลง
และมีความแปรปรวนมากขึ้น ฝนฟ้าไม่เป็นไปตาม ฤดูกาล ถ้าเป็นอย่างนี้อีกต่อไป
น้ำมีจำกัดแน่นอน เห็นด้วย
51. น้ำใช้แล้วหมดไป ซึ่งปัจจุบันทรัพยากรน้ำลดลงเนื่องจากสภาพอากาศที่ร้อนขึ้น
52. น้ำสะอาดที่เหมาะสำหรับดื่มมีอยู่จำกัด
53. การสามารถเข้าถึงน้ำย่อมถูกจำกัด แม้นว่า น้ำจะไม่หมดไปจากโลก
แต่ความสามารถที่จะนำทรัพยากรน้ำมาใช้ให้เกิดประโยชน์นั้น มีความจำกัด
54. น้ำเป็นสิ่งที่สำคัญในการดำรงชีวิต ควรช่วยกันถนอมรักษาและใช้อย่างประหยัด
ก่อนที่จะขาดแคลนน้ำ
55. ปัจจุบันนี้ได้เห็นปรากฏการณ์ของการขาดแคลนน้ำ
56. ในเมืองไทยประสบปัญหาภัยแล้งทุกๆปี ถึงแม้ว่าบางครั้งภาคใต้กำลังมีปัญหาน้ำท่วม
แต่ภาคเหนือเกิดภัยแล้ง และยังมีหลายเหตุ-
การณ์ที่บ่งชี้ถึงการเปลี่ยนแปลงของทรัพยากรธรรมชาติ
57. เพราะทรัพยากรทุกอย่าง ย่อมมีอย่างจำกัด ถึงแม้บางอย่างจะผลิตได้
แต่ต้องใช้ต้นทุนการผลิตที่สูง
58. เพราะวิกฤตการณ์โลกร้อน ทำให้น้ำใช้มีจำกัดและขาดแคลน ควรเห็นถึงความสำคัญ

59. ข้อเท็จจริงเกี่ยวกับน้ำที่มีอยู่อย่างจำกัด
อาจขัดแย้งกับความเป็นจริงของโลกซึ่งมีน้ำเป็นส่วนประกอบ มากกว่าพื้นดิน
แต่น้ำส่วนใหญ่เป็นน้ำเค็ม หากว่า มนุษย์ยังไม่สามารถที่จะนำน้ำเค็ม
มาเข้ากระบวนการทำให้กลายเป็นน้ำจืดบริโภคได้นับว่า น้ำที่ใช้อุปโภคบริโภคได้นั้น
เหลือน้อยเต็มที
60. หากใช้กันเกินก็ขาดได้
61. เนื่องด้วยน้ำที่เป็นน้ำสะอาดสำหรับหุงอาหารหรือการใช้ดื่มจำเป็นต้องผ่านกรรมวิธีที่เหมาะสม
ตัวอย่างเช่นประเทศดูไบ น้ำถือเป็นทรัพยากรที่มีค่า
62. แหล่งน้ำจืดที่สามารถกินได้บนผิวดินมีน้อย

Disagree

1. ไม่เห็นด้วย เนื่องจากในความเป็นจริงน้ำเป็นทรัพยากรที่มีมากมาย
และตามรายงานขององค์การสหประชาชาติก็ยังได้ยืนยันว่า
ทรัพยากรน้ำของโลกนั้นมีเพียงพอสำหรับคนทุกคนบนโลก
หากแต่ปัญหาการขาดแคลนน้ำทุกวันนี้นั้นสืบเนื่องมาจากการบริหาร จัดการน้ำที่ไม่มีคุณภาพ
คอร์รัปชั่น การขาด นโยบายการจัดการน้ำที่เหมาะสม
ความล่าช้าของระบบราชการและการขาดการลงทุนทั้ง ทางการบุคลากรและโครงสร้าง
เหล่านี้ทำให้ปัญหาการขาดแคลนน้ำเกิดขึ้นต่อเนื่องสะสมมาตามลำดับ
ทำให้หลายๆประเทศเกิดภาวะ ขาดแคลนน้ำเกิดขึ้น ซึ่งนำพาไปสู่ปัญหาอื่นๆ ที่ตามมา
2. เพราะน้ำยังหมุนเวียนอยู่ในโลก คำว่าน้ำในที่นี่คือน้ำทุกประเภท ไม่ได้แยกว่าเป็นน้ำดี น้ำเสีย
หรือไอน้ำ
3. น้ำนำมาหมุนเวียนหรือผ่านกระบวนการเพื่อนำมาใช้ใหม่ได้
4. เพราะรู้สึกว่าเป็นพลังงานหมุนเวียน ที่สามารถก่อให้เกิดขึ้นได้ตามธรรมชาติ
เพียงแต่ไม่สามารถควบคุมให้เกิดได้ตามเวลาที่เราต้องการ (บางครั้งก็แล้ง
บางครั้งน้ำท่วม...เอาใจยากจริง พูดเล่นๆนะคะ)
5. เพราะสสารไม่มีการสูญหาย แต่อาจเปลี่ยนแปลงสภาพได้
น้ำกลายเป็นไอน้ำแล้วกลั่นตัวเป็นฝนหรือหิมะวนเวียนอยู่ในโลกนี้
6. น้ำนำมาบำบัดได้ไม่เหมือนกับน้ำมันที่ใช้แล้วหมดไป

2.5 Why?

Agree

1. เพราะน้ำเป็นปัจจัยหลักในการทำการเกษตร ถ้าไม่มีน้ำ ก็ไม่มีปัจจัยที่เอาไปใช้ในการปลูกพืช
เลี้ยงสัตว์ ซึ่งถือเป็นอาหารหลักที่สำคัญ
2. เพราะน้ำเป็นสิ่งหล่อเลี้ยงสรรพสิ่งต่างๆในโลกนี้ไม่ว่าจะเป็นพืชหรือสัตว์

3. น้ำเป็นสิ่งที่หล่อเลี้ยงพืชพันธุ์อาหารเกือบทุกชนิด โดยทั้งทางตรงและทางอ้อม
4. ภาคเกษตรและภาคอุตสาหกรรมที่ต้องใช้ในการผลิตอาหาร มีความจำเป็นต้องใช้น้ำ
5. น้ำจำเป็นต่อการทำปศุสัตว์และเกษตรกรรม
6. น้ำเป็นปัจจัยสำคัญที่ต้องนำมาใช้ในภาคการเกษตรอยู่แล้ว
   ดังนั้นไม่ว่าจะผลิตอาหารอะไรก็ต้องอาศัยปัจจัยหลักที่สำคัญคือน้ำ
7. การจะทำอาหารได้ต้องอาศัยน้ำ
8. น้ำมีความจำเป็นในกระบวนการผลิตสินค้าต่างๆ รวมทั้งการบริโภคด้วย
   ดังนั้นเราจึงขาดน้ำไม่ได้ เพราะน้ำเป็นส่วนหนึ่งของชีวิต
9. เห็นด้วย เพราะว่าน้ำเป็นองค์ประกอบสำคัญของการดำรงชีวิต ในการผลิตอาหาร
   เริ่มตั้งแต่กระบวนการเพาะปลูก และเพาะเลี้ยง จำเป็นต้องอาศัยน้ำทั้งสิ้น
   ไปจนถึงขั้นตอนการผลิตอื่นๆ ก่อนออกมาเป็นสินค้าสำเร็จรูปก็มีน้ำเป็นปัจจัยในการผลิตทั้งสิ้น
10. Food make from water.
11. ปลูกพืช เลี้ยงสัตว์ ต้องใช้น้ำ ไม่มีน้ำก็ปลูกพืช เลี้ยงสัตว์ไม่ได้
12. ถ้าไม่มีน้ำก็จะไม่สามารถใช้น้ำในการทำการเกษตรหรือแม้แต่เลี้ยงสัตว์ได้
    เพราะฉะนั้นการขาดน้ำจึงถือเป็นการขาดปัจจัยตัวสำคัญ ในการเกษตรและอุตสาหกรรม
13. น้ำมีความสำคัญพอๆกันหรือมากกว่าอาหารครับ คนเราขาดน้ำได้ไม่ถึงสามวันก็อาจจะตายกันได้
    แต่ขาดอาหารยังทนกันได้เป็น เดือนๆครับ
14. ทุกๆกระบวนการต้องใช้น้ำเป็นส่วนประกอบ
15. ไม่มีน้ำทำเกษตร
16. อาหารมาจากเกษตรกรรม ไม่มีน้ำก็ทำเกษตรกรรมไม่ได้ อาหารก็ไม่มี
17. น้ำเป็นสิ่งจำเป็นของสิ่งมีชีวิต
18. ขาดน้ำดื่มไม่นานก็เสียชีวิต การไม่มีน้ำก็ทำให้ไม่สามารถเพาะปลูกได้
    พืชผลที่นำมารับประทานก็ลดลง และยังทำให้ไม่มีวัตถุดิบใน การเลี้ยงสัตว์
    ดังนั้นแหล่งอาหารจึงลดลงทั้งจากพืชและสัตว์
19. ถ้าขาดน้ำ เกษตรกรก็ตายหมด แล้วใครจะมาปลูกข้าวให้เรากิน
20. น้ำเป็นปัจจัยอย่างหนึ่งที่สำคัญที่สุดในการดำรงชีวิตของมนุษย์ ทั้งอุปโภคและบริโภค
    อาหารทุกชนิดที่เรารับประทาน ล้วนใช้น้ำเป็น ส่วนประกอบหลักทั้งสิ้น
21. น้ำเป็นสิ่งจำเป็นสิ่งหนึ่งต่อร่างกายไม่แพ้อาหาร ขาดน้ำก็ตาย ขาดอาหารก็ไม่รอด
22. จากข้อมูลในสารคดีที่ได้รับชม ก็คือคำตอบที่ชัดเจนแล้วครับว่า
    เราจะผลิตอาหารเลี้ยงพลเมืองโลกไม่ได้เลย หากยังขาดการบริหาร จัดการน้ำที่ดีพอ

23. เนื่องจากน้ำเป็นองค์ประกอบหลักของภาคการเกษตร ซึ่งเป็นแหล่งอาหารหลักของโลก หากปริมาณน้ำไม่เพียงพอ จะทำให้พืชผลทาง การเกษตรไม่ได้ผลอย่างที่ควรจะเป็น การขาดน้ำจึงมีผลกระทบโดยตรงต่อการขาดอาหารด้วย
24. สิ่งมีชีวิตทุกสิ่ง มีน้ำเป็นส่วนประกอบอย่างน้อย 80% ถ้าขาดน้ำก็เท่ากับขาดชีวิต ไม่ใช่แค่ขาดอาหารเท่านั้นค่ะ
25. การผลิตอาหารทั้งหมดต้องใช้น้ำเป็นส่วนประกอบ รวมทั้งกระบวนการแปรสภาพอาหารด้วย
26. เนื่องจากมนุษย์เราหากขาดอาหารยังสามารถมีชีวิตอยู่ได้นานกว่าขาดน้ำ นั่นหมายถึง หากเราขาดทั้งน้ำและอาหารด้วยแล้ว เราก็ไม่สามารถมีชีวิตอยู่ได้ ดังนั้น หากเราขาดน้ำที่จะนำมาใช้ในการผลิตอาหารด้วยแล้ว เราก็จะไม่สามารถมีชีวิตอยู่ได้แน่นอน
27. น้ำเป็นส่วนหนึ่งของอาหาร
28. น้ำเป็นส่วนประกอบของสิ่งมีชีวิตทุกประเภท
29. ทุกชีวิตต้องการน้ำ สัตว์ไม่มีน้ำก็ตาย พืชไม่มีน้ำก็ตาย ถ้าสัตว์และพืชตายหมด คนก็ตายด้วยเพราะขาดอาหาร
30. การขาดน้ำทำให้ไม่สามารถเพาะปลูกได้
31. เพราะอาหารทุกอย่างต้องอาศัยน้ำในการผลิต
32. น้ำใช้ในการเกษตรกรรม
33. น้ำ เป็นจุดเริ่มต้นของสิ่งมีชีวิตหลากหลายชนิดบนโลก เป็นสิ่งสำคัญที่ถ้าหากขาดไปจะทำให้สิ่งมีชีวิตบนโลกไม่สามารถดำรงชีวิต หรือสืบเผ่าพันธุ์ต่อไปได้
34. ชัดอยู่ในตัว
35. น้ำก็เป็นอาหาร ไม่มีน้ำ ก็ทำอาหารอื่นไม่ได้ ไม่เห็นต้องอธิบายเลย ไม่ได้กวนนะครับ มันเป็นอย่างนั้น ผมว่าพวกฝรั่งมันคงอยากบีบ เกษตรกรไทยมากกว่า และต้องเสียเงินจ้างฝรั่งมันมาตรวจ มาออกใบ certificate ให้พวกมันมีช่องทางหากินมากขึ้น
36. ภาวะโลกร้อนและการเปลี่ยนแปลงสภาพภูมิอากาศ ทำให้ฝนไม่ตกตามฤดูกาล ปริมาณน้ำอาจมีมากในบางช่วง แต่ยังไม่มีกลไกหรือขาด ความสนใจในการรักษาน้ำไว้ให้สามารถนำมาใช้เพาะปลูกหรือเลี้ยงสัตว์ได้ จะส่งผลให้พืชผลทางการเกษตรและปศุสัตว์ลดต่ำลง
37. ส่วนใหญ่ภาคการเกษตรเป็นแหล่งผลิตอาหารของโลก ซึ่งต้องอาศัยน้ำเป็นปัจจัยการผลิตที่สำคัญสุด ถ้าขาดน้ำภาคการเกษตร ก็จะดำเนินไปไม่ได้
38. ไม่มีน้ำ เกษตรกรไม่มีทรัพยากรในการผลิตพืชพันธุ์ธัญญาหาร ไม่เจริญเติบโต การปศุสัตว์ไม่สามารถทำได้ส่งผลทำให้เกิดการขาดแคลน
39. เนื่องจากกระบวนการผลิตอาหารใช้น้ำเป็นส่วนประกอบหลักสำคัญ

40. อาหารที่มนุษย์บริโภคเป็นสิ่งมีชีวิตที่ต้องใช้น้ำเพื่อทำให้เจริญเติบโต
พร้อมที่จะให้มนุษย์รับประทาน ถ้าขาดย่อมทำให้สิ่งมีชีวิตเหล่านี้
กลายเป็นอาหารของมนุษย์ไม่ได้
41. เพราะน้ำเป็นส่วนประกอบหลักของอาหารส่วนมาก
42. เพราะสิ่งมีชีวิตบนโลกนี้ย่อมดำรงชีวิตอยู่ได้ด้วยน้ำเป็นปัจจัยสำคัญไม่ว่าจะเป็นพืชหรือสัตว์
ย่อมใช้น้ำในการดำรงชีวิตทั้งสิ้น
ถ้าขาดน้ำแล้วสิ่งที่เป็นอาหารของสิ่งมีชีวิตย่อมมีผลในการมีชีวิตอยู่ เพราะฉะนั้น
เมื่อขาดน้ำก็ไม่สามารถที่จะมีสิ่งมีชีวิตดำรงอยู่ได้
43. น้ำเป็นส่วนประกอบพื้นฐานของสิ่งมีชีวิตเกือบทุกชนิดบนโลกนี้
44. เพราะถ้าไม่มีน้ำ อาหารก็เกิดไม่ได้
45. It uses water to grow.
46. เพราะอาหารส่วนใหญ่จะมีน้ำเป็นส่วนประกอบอยู่ไม่มากก็น้อย
47. แหล่งอาหารไม่ว่าพืชหรือสัตว์ย่อมอาศัยน้ำ
48. เพราะน้ำเป็นตัวdiluteสารอาหารที่เป็นอาหารไปเลี้ยงพืชหรือสัตว์ ซึ่งจำเป็นในการเติบโต
49. ขาดน้ำก็ปลูกพืชไม่ได้
50. น้ำเป็นส่วนประกอบสำคัญในการผลิต เราปลูกพืช หากฝนไม่ตกและไม่รดน้ำ
แร่ธาตุก็เข้าไปเลี้ยงต้นไม่ได้ ผลผลิตย่อมน้อยไปจน ขาดแคลน
ถ้าหากเรามีความขาดแคลนน้ำขึ้น และไม่จัดสรรทรัพยากรน้ำดีๆ รับรองต้องมีแย่งแหล่งน้ำ
ต้องมีสงครามแย่งทรัพยากร กันนะ ทีนี้ก็เรื่องใหญ่มากเพราะเปลี่ยนแปลงธรรมชาติเข้าด้วย
สร้างเขื่อนอุตลุดกันไปหมด เปลี่ยนทางน้ำ เปลี่ยนแปลงภาวะธรรมชาติ
อันนี้ก็เห็นด้วยแล้วแน่นอน ถ้าขาดน้ำก็เท่ากับขาดอาหารล่ะ
51. เพราะน้ำเป็นส่วนประกอบหลักของอาหาร
52. น้ำ H_2O เป็นสิ่งจำเป็นในกระบวนการผลิตพืชและสัตว์ ไม่มีน้ำ ก็ไม่มีการผลิต
ไม่มีการเจริญเติบโต แล้วก็คงไม่มีอาหาร
53. น้ำมีความสำคัญยิ่งต่อร่างกาย
54. น้ำมีความจำเป็นต่อสิ่งมีชีวิต
55. เพราะน้ำเป็นส่วนหนึ่งของอาหาร
56. น้ำเป็นแหล่งนำพาสารอาหาร และเป็นองค์ประกอบสำคัญของทุกสิ่งมีชีวิต
57. น้ำคือปัจจัยแรกที่ขาดไม่ได้ของมนุษย์ ในร่างกายของเรามีน้ำเป็นส่วนประกอบหลักด้วย ฉะนั้น
ขาดอาหารยังพออยู่ได้ แต่ถ้าขาดน้ำอยู่ไม่ได้
58. เพราะน้ำเป็นปัจจัยสำคัญที่สุดสำหรับการปลูกพืชและเลี้ยงสัตว์
59. น้ำจำเป็นกว่าอาหาร

60. ร่างกายสามารถขาดอาหารได้หลายวัน แต่ไม่สามารถขาดน้ำได้
ดังนั้นน้ำจึงจัดว่าเป็นอาหารอย่างหนึ่งเช่นกัน

61. น้ำเป็นส่วนประกอบหลักของร่างกาย ถ้าร่างกายขาดอาหาร คนสามารถอยู่ได้
แต่ถ้าร่างกายขาดน้ำ คนจะไม่สามารถอยู่ได้

62. ขาดน้ำ = ขาดอาหาร
ขาดน้ำ = ขาดเครื่องนุ่งห่ม
ขาดน้ำ = ขาดที่อยู่อาศัย
ขาดน้ำ = ขาดไฟฟ้า
ขาดน้ำ = ขาดเชื้อเพลิง เช่น น้ำมัน
ขาดน้ำ = ขาดสิ่งของเครื่องใช้อุปโภคบริโภค
ขาดน้ำ = ขาด ฯลฯ
น้ำ เป็นสิ่งสำคัญในทุกกระบวนการผลิตที่จะขาดไม่ได้

<u>Disagree</u>

1. น้ำสำคัญกว่านั้น
2. Lacking of the water is worse!
3. น้ำสำคัญกว่าอาหาร
4. น้ำมีความจำเป็นต่อร่างกายเป็นอย่างมากและมากกว่าการขาดอาหาร
จากสถิติร่างกายขาดน้ำไม่เกิน 2-3 วัน อาจส่งผลทำให้เสียชีวิตได้
กรณีขาดอาหารร่างกายอยู่ได้ 7 วัน
5. ขาดน้ำ = ขาดชีวิต
6. เพราะน้ำเป็นสื่อกลางในการขนส่งสารอาหารและอ๊อกซิเจนในร่างกายเท่านั้น ไม่ใช่สารอาหาร
7. ขาดน้ำ 7 วัน ทำให้คนเสียชีวิต แต่ขาดอาหาร 1 เดือนจึงทำให้คนเสียชีวิต
8. น้ำสำคัญกว่าอาหาร

Comment/suggestion

1. จากสภาพในปัจจุบัน มีการใช้ทรัพยากรอย่างสิ้นเปลือง ไม่เฉพาะแต่น้ำเท่านั้น
ทรัพยากรด้านอื่นๆก็มีการใช้อย่างสิ้นเปลือง
เกินความจำเป็นจึงเห็นควรช่วยกันรณรงค์ให้มีการใช้ทรัพยากรให้เกิดประโยชน์อย่างคุ้มค่า
2. ขอชื่นชมผู้นำเสนอแนวความคิดนี้ ทำให้ผู้บริโภคและผู้ผลิตทุกภาคส่วนได้มีส่วนร่วม
ในการใช้ทรัพยากรน้ำอย่างมีคุณค่า เพื่อความยั่งยืนและทำให้โลกน่าอยู่

3. แบบสอบถามไม่สมบูรณ์ในบางหัวข้อ อาจจะด้วยเพราะ form หรือ file ที่ไม่สมบูรณ์ในการจัดหน้าทำให้ wording หายไปในบางหัวข้อ และข้อเลือกไม่ตรงกับ line ซึ่งต้องใช้การเดาในการอ่านคำถามและบางหัวข้อมีข้อเลือกซ้ำกัน 2 ครั้ง
4. ถ้าใช้รูปรอยเท้าจะต้องทำการประชาสัมพันธ์เยอะ เพราะไม่ค่อยสื่อสารให้คนไทยเข้าใจได้ชัดเจนนัก
5. ในการกำหนดราคาสินค้าที่ติดฉลาก Water footprint แล้วราคาสินค้าเพิ่มขึ้นกว่าสินค้าที่ไม่ได้แปะนั้น อาจจะเป็นการไม่ดึงดูดผู้บริโภคในการซื้อสินค้า เนื่องจากเรื่องน้ำผู้บริโภคยังเห็นว่าไกลตัว ซึ่งต่างจากสินค้าที่ติดฉลาก Bi-oproduct ไร้สารตกค้าง ซึ่งสามารถดึงดูด ได้มากกว่า
เนื่องจากเป็นเรื่องใกล้ตัวและเกี่ยวกับสุขภาพ ดังนั้นจึงมีความเห็นว่า
   (1) ราคาควรจะเท่ากับท้องตลาดเหมือนเดิม หรือว่าน้อยกว่าถ้าเป็นไปได้ หรือ
   (2) ควรจะมีการเริ่มต้นติดฉลาก water footprint ร่วมกับ ฉลากของสินค้าอย่าง bioproduct เพื่อเพิ่มมูลค่าของสินค้าตัวนั้น ซึ่งสามารถดึงดูดได้ดีอยู่แล้ว
6. เรื่องราคา คิดว่าควรเท่าเดิมเพราะ ผู้ผลิตได้กำไรเพิ่มขึ้นจากการลดต้นทุนการใช้น้ำอยู่แล้ว (รวมถึงต้นทุนอื่นๆ เช่น ค่าไฟ ค่าบำบัดน้ำ)
ดังนั้นผู้ผลิตไม่จำเป็นต้องเอากำไรเพิ่มจากการขึ้นราคาอีก
7. ควรมีการอธิบายในวงกว้าง และส่งเสริมให้ตระหนักถึงความสำคัญของน้ำ ทั้งควรมีการอธิบายกันว่า water footprint นั้นจะเข้ามามีบทบาทอย่างไรในการช่วยเรื่องน้ำนี้ครับ
8. Presentation ดีมากเลย เข้าใจง่ายด้วย :D
Water footprint จะมีในประเทศไทยได้หรือ? ชั้นคิดว่าประเทศไทยค่อนข้างล้าหลังอ่ะ จะทำอะไรดีๆอย่างนี้มันต้องเป็นรายใหญ่ๆมาทำอ่ะ ถ้าเป็นรายเล็กๆน้อยๆ ไม่น่าจะทำได้อ่ะ แต่ถ้าทำได้มันก็เป็นสิ่งที่ดีนะ แต่ถ้าทำได้แล้วต้นทุนสูง+ราคาขายแพง ก็น่าจะขายได้แค่กับลูกค้า บางกลุ่ม
9. ปัญหาเรื่องฉลากอยู่ที่ความน่าเชื่อถือ เพราะหลายๆฉลากเหมือนติดไป แต่ยืนยันอะไรไม่ได้ว่าเป็นอย่างนั้นจริงไหม
10. สาเหตุของคำตอบข้อ 1.3-1.6 ที่ตอบว่า "ไม่ซื้อ" เพราะว่าหากผู้ผลิตสามารถลดการใช้น้ำได้จริง ไม่ว่าจะเป็นการลดด้วยวิธีใดก็ตาม ต้นทุนเรื่องน้ำก็จะลดลง ดังนั้น ต้นทุนสินค้าควรจะต้องลดลง ซึ่งจะส่งต่อไปถึงราคาสินค้าที่ควรจะลดลงด้วยเช่นกัน เหตุใดถึงเพิ่มราคาสินค้าและผลักภาระราคาสินค้าให้ผู้บริโภค
ผู้ผลิตไม่มีสิทธิ์อ้างว่าได้ลงทุนกับเรื่องการประหยัดน้ำไปเป็นจำนวนมาก เพราะมันเป็นสิ่งที่คุณต้องรับผิดชอบต่อสังคม หากผู้บริโภคเล็งเห็นตรงจุดนี้ว่าผู้ผลิตเต็มใจผลิตเพื่อรักษ์โลก

มันก็จะส่งผลดีต่อบริษัทในระยะยาวเอง ไม่สามารถเปรียบเทียบได้กับการปลูกผักปลอดสารพิษ
เพราะผักที่ปลอดสารพิษนั้นเป็นสิ่งที่ผู้บริโภคได้ประโยชน์จริงๆ ไม่ได้บริโภค
สารพิษเข้าสู่ร่างกาย
ผู้บริโภคยอมรับในราคาที่สูงขึ้นเพื่อแลกกับประโยชน์ที่เขาจะได้รับกลับคืนมา
แต่เมื่อเปรียบเทียบกับการผลิต ที่ใช้น้ำลดลงนั้น คุณค่าของผลิตภัณฑ์นั้นก็เหมือนเดิม
ผู้บริโภคไม่ได้ประโยชน์ใดๆเพิ่มขึ้น นอกจากเพียงรับรู้ว่ามีการใช้น้ำในการผลิต จำนวนลดลง :)

11. ลักษณะการตอบแบบสอบถามด้วยคอมพิวเตอร์นั้น มีข้อดีคือสะดวกรวดเร็วผู้คนเข้าถึงได้ง่าย
แต่ก็มีผู้คนอีกจำนวนมาก (และอาจเป็น ส่วนใหญ่ของประเทศ)
ที่มีบทบาทสำคัญในตลาดผู้บริโภคที่เข้าไม่ถึง เช่น แม่ค้า พ่อค้า คนใช้แรงงาน
คนที่ไม่ได้ทำงานที่ต้องใช้ คอมพิวเตอร์ ฯลฯ จึงคิดว่าอาจจะต้องหาวิธีเพื่อเข้าถึงให้มากขึ้นค่ะ
ทั้งนี้เพื่อที่จะได้ทำการเปรียบเทียบความเห็นของคนหลายๆกลุ่ม หลายๆฐานะ-อาชีพ
ซึ่งจะทำให้งานวิจัยมีคุณค่ามากขึ้นค่ะ โชคดีนะคะ
12. ถ้าจะเอามาใช้ที่ประเทศไทยคงต้องให้ความรู้กันอีกเยอะเลย
เพราะว่ายังไม่เห็นว่ามันจะมีผลกับโลกได้มากน้อยแค่ไหน กับเงินที่ต้องจ่ายแพงขึ้น
13. You should do a lot of campaign and PR to promote this program.
14. การเปรียบเทียบปริมาณน้ำใช้ในกระบวนการผลิตใดๆ
ควรเป็นการเปรียบเทียบกับปริมาณน้ำใช้สำหรับเทคโนโลยีการผลิตเดียวกัน
เพราะเทคโนโลยีที่แตกต่างกันมีผลต่อการใช้น้ำด้วย ในขณะเดียวกันการลดปริมาณน้ำ
ใช้ในกระบวนการผลิตต้องไม่กระทบต่อ คุณภาพของสินค้าด้วย
เราอาจต้องระวังเรื่องการลดปริมาณน้ำที่ใช้กับสินค้าที่ใช้เครื่องหมายฮาลาล
เนื่องจากเขาจะไม่ยอมรับสินค้า ที่มีการใช้น้ำจากกระบวนการ Recycle and Reuse ค่ะ
15. มีบ้างข้อ ที่สามารถตอบได้แต่ไม่ตรงใจซะทีเดียว ในหัวข้อที่ 4.4
ด้วยความไม่แข็งแรงของกฎหมายบ้านเมือง และความไม่แข็งแรงของ
ความรับผิดชอบต่อตนเองและชุมชนของสังคมไทย จึงทำให้คิดว่าเรื่องนี้อาจเป็นเรื่องยาก
แต่ก็เป็นไปได้ค่ะ
16. ข้อ 4.3
ไม่เข้าใจว่าอะไรคืออาหารและเครื่องดื่มเพื่อการอนุรักษ์สิ่งแวดล้อมและเป็นมิตรกับสิ่งแวดล้อม
เพราะไม่ได้ยกตัวอย่างมาให้ และก็ไม่ทราบได้ โดยในร้านขายไม่เคยมีการแจ้งข้อมูลนี้
จึงไม่สามารถตอบให้ได้
ข้อ 4.4 ถามว่าท่านในฐานะผู้บริโภค (กล่าวคือเพียงคนเดียว)
แต่หากเปลี่ยนคำถามว่าผู้บริโภคจำนวนมากแล้ว จะเลือกคำตอบอื่น

17. ภาครัฐ ที่มีส่วนรับผิดชอบโดยตรงและเกี่ยวข้อง
ควรเข้ามาให้การสนับสนุนและให้ข้อมูลกับผู้ผลิตและผู้บริโภค เพื่อความเข้าใจที่ถูกต้อง
และมีความน่าเชื่อถือมากยิ่งขึ้น
18. ควรอธิบายเรื่อง water footprint ให้คนทั่วไปเข้าใจง่ายๆ
19. เป็นการทำวิจัยทีดีค่ะ ขอสนับสนุนต่อไป มีอะไรให้ช่วยก็บอกได้เลยนะคะ
20. คือถ้ามีอะไรให้ช่วยก็บอกนะคับ คนไทยด้วยกัน ^^
ป.ล. คลิปทำดีคับ ใช้โปรแกรมอะไรตัดต่อนะ
21. - คิดได้ดี ถ่าย vdo ด้วย น่าสนใจ แต่ใช้เวลานานไปหน่อย
- ค่าเฉลี่ยต่างๆที่ว่ามา มันจริงหรือ หรือแค่ฟังตามๆกันมา ควรแสดงที่มาและทำให้คนเชื่อได้
ไม่ใช่โมเม
- ถ้ามีน้ำอยู่มากมาย ไม่ใช้ มันก็ไหลไปเรื่อย ก็ไม่ได้ใช้ประโยชน์
- ปกติก็ไม่มีใครไม่อยากประหยัดน้ำ เพราะมันเสียเงิน (ถ้าใช้น้ำมาก) เสียเวลา (ถ้าใช้น้ำมากไป)
และเสียหาย (หากรดน้ำผักมากไป) ภาคการเกษตรใช้น้ำอย่างสิ้นเปลืองหรือไร้ประสิทธิภาพ ----
-- หมายถึงภาคไหนครับ หรือไอ้หรั่งมันเห็นไทยดำนำแล้วปล่อยน้ำออกจากนา
กลายเป็นการสิ้นเปลืองครับ?????????????
22. ถือเป็นงานวิจัยที่จะเป็นองค์ความรู้ที่มีประโยชน์ต่อโลกเป็นอย่างมาก
เพราะอนาคตไม่นานน้ำจะเป็นปัญหาต่อมนุษย์อย่างแน่นอน มีหลายประเทศเริ่มเห็นแก่ตัว
กักน้ำไว้ใช้ในประเทศของตัวเอง ด้วยการสร้างเขื่อนเช่น แม่น้ำโขง
หากผลงานวิจัยเสร็จสมบูรณ์อยากจะขอความกรุณาส่งมาให้อ่านบ้างนะครับ
ยินดีครับที่ได้มีส่วนร่วมในงานวิจัย...สำเร็จการศึกษาแล้วให้กลับมาทำงานในประเทศไทยนะครับ
23. ยังเป็นเรื่องใหม่สำหรับประเทศไทย แต่ถือว่าเป็นสิ่งที่ดีหากสามารถทำได้
เหมือนกับการกำหนดมาตรฐานคุณภาพผลิตภัณฑ์ มาตรฐานด้านสิ่งแวดล้อมหรืออื่นๆ
ที่องค์กรต่างๆได้เคยทำมา แต่กังวลเรื่อง
(1) อาจส่งผลให้ต้นทุนในการผลิตสูงขึ้น เนื่องจากต้องใช้ Technology
มาใช้ในกระบวนการผลิตและส่งผลให้ราคาสินค้าสูงขึ้นตาม ไปด้วย
(2) ผู้บริโภคไม่สามารถเข้าถึงได้ทุกกลุ่ม เนื่องจากกำลังซื้อไม่เท่ากัน
อยากให้การพัฒนาดังกล่าว ไม่กระทบต่อราคาสินค้า เพราะจะทำให้
ผู้บริโภคได้รับผลกระทบและการตัดสินใจซื้อลดลง
หรือผู้บริโภคอาจจำเป็นต้องซื้อสินค้าในราคาที่สูงเกินความจำเป็น
24. เห็นด้วยอย่างยิ่งในการผลักดันเรื่องนี้ ขออวยพรให้งานวิจัยชิ้นนี้ประสบความสำเร็จนะคะ รักเรา
รักษ์โลก ช่วยๆกันค่ะ ยินดีให้ความร่วมมือในโครงการดีๆเช่นนี้เสมอ

25. เป็นงานวิจัยที่ดีมากเลยนะคะ ยินดีให้ความร่วมมือค่ะ
หวังเป็นอย่างยิ่งว่าผลงานวิจัยของคุณจะได้รับ การเผยแพร่ให้ประชาชน
โดยทั่วไปได้รับรู้รับทราบ จะได้ร่วมแรงร่วมใจกันใช้น้ำอย่างประหยัด
และผลที่สุดสามารถสร้างแรงผลักดันให้หน่วยงานทั้งภาครัฐ ภาคเอกชน ผู้มีส่วนเกี่ยวข้องทุกคน
ร่วมมือกันหาวิธีบริหารจัดการน้ำได้อย่างมีประสิทธิภาพนะคะ และสุดท้ายขอส่งแรงใจ
ให้ประสบความสำเร็จในการทำงานวิจัยนะคะ

26. การศึกษา water footprint น่าจะเอาแนวคิด externality ทางเศรษฐศาสตร์เข้ามาประยุกต์
โดยเป็นการส่งผ่านต้นทุนของสังคม (social cost)
ที่จะต้องจัดหาน้ำที่บริโภคได้มาให้กับภาคเกษตรและอุตสาหกรรมไปให้กับผู้ผลิต
กลายเป็นต้นทุนของกิจการ (private cost) ซึ่งจะทำให้
ผู้ผลิตมีการเปลี่ยนแปลงระดับการผลิตให้เหมาะสมกับต้นทุนที่เพิ่มขึ้น
โดยผู้ผลิตจะผลิตในจำนวนสินค้าที่ทำให้ตนเสียต้นทุน ส่วนเกินที่เกิดจากคนไม่ซื้อเพราะไม่มี
water footprint น้อยที่สุด

27. - ชอบเรื่องที่วิจัยนะ น่าสนใจมาก ๆ
- อยากให้มีการออกแบบโลโก้ให้สื่อถึงเรื่อง Water Footprint มากกว่านี้
- น่าจะมีการตั้งชื่อภาษาไทยให้กับ Water Footprint เพื่อสร้างความเข้าใจแก่คนไทยส่วนใหญ่
เช่น "ต้นทุนน้ำแอบแฝง" – คิดว่าน่าจะเป็นวิจัยที่ให้คนต่างชาติ

28. Foot symbol is not ok for the Asian. Can u change?

29. ความคิดสร้างสรรค์ดี น่าสนใจ

30. ขอเสนอเป็นคำถามที่เราสนใจแทนละกัน เผื่อเอาไปช่วยศึกษาต่อ
(1) สนใจเรื่อง linkage ระหว่าง น้ำ อาหาร และพลังงาน
ซึ่งน่าจะมีอิทธิพลอย่างมากต่อโลกในอนาคต
(2) ถ้าวันหนึ่ง หากน้ำมีการขาดแคลนมากจนทำให้น้ำกลายเป็นสินค้า Commodity
มีการปั่นราคากันในตลาดโลกสนุกสนาน
ประเทศไทยจะมีการบริหารจัดการการใช้น้ำในประเทศอย่างไร
(3) Technology ที่จะมาช่วยผลิตน้ำ เช่น น้ำเค็มเป็นน้ำจืดหรือ Technology
ระบบการบริหารจัดการน้ำปัจจุบัน มีความคืบหน้า เพียงใด
และจะเข้ามาช่วยบรรเทา/แก้ไขวิกฤติน้ำที่จะเกิดขึ้นในอนาคตได้ทันเวลา
ตามปริมาณความต้องการน้ำที่เพิ่มขึ้นหรือไม่

31. ตัวเลขการประหยัดน้ำ น่าจะวงเล็บเป็น % ไว้ด้วย เช่น -400 (10.0%) ผู้บริโภคจะได้ตัดสินใจว่า
ราคาแพงกว่าปกติ 10% ชดเชยไป กับการประหยัดน้ำได้ 10% จะคุ้มค่าไหม

32. แบบสอบถามน่าจะเป็นแนวการอนุรักษ์ที่ตัวบุคคลมากกว่าไม่ใช่แค่ตัว product
โดยชี้ให้เห็นถึงความสำคัญหรือจำเป็นมากกว่านี้ ว่าอนาคตถ้าไม่มีการวางแผน
ทรัพยากรน้ำจะหมดไป เพื่อให้ทุกคนตระหนักมากขึ้น ถึงมี product
ที่ดีแต่ขาดสำนึกของผู้บริจาค
ผู้บริจาคคงไม่ยินดีที่จ่ายเงินที่แพงกว่าเพื่อซื้อสินค้าชนิดนั้นในสภาพเศรษฐกิจอย่างนี้เพราะไม่เ
ห็นความสำคัญของทรัพยากรน้ำแน่นอน
33. ต้องมีการประชาสัมพันธ์และปลูกจิตสำนึก
34. การช่วยส่งเสริมและสนับสนุน ร่วมกันเปิดโอกาสให้กับโครงการอนุรักษ์พลังงาน
ในปัจจุบันถือว่าสำคัญและมีบทบาทมากขึ้น แต่ในทางรูปธรรมอาจทำได้ยาก
เนื่องจากกลไกทางตลาดและการให้ความร่วมมือจากภาครัฐและองค์กรต่างๆ อาจไม่เปิดกว้างพอ
จึงอยากให้ช่วยกันรณรงค์ให้มากขึ้น เพื่อโลกใบนี้และเพื่อมนุษยชาติต่อไป
35. น่าจะมีตัวเลือกของราคาที่ถูกลง
เพราะต้นทุนการผลิตที่ลดการใช้น้ำเท่ากับประหยัดได้ราคาจึงควรถูกลง

Paper-based survey questionnaire

1.2 Why?

Type A

1. น้ำเป็นสิ่งจำเป็นและสำคัญในการดำรงชีวิต
2. ดูดีมีจุดเด่นดึงดูดผู้บริโภค
3. สวยงาม สะดุดตา มีสาระ
4. เห็นจำนวนรวมของการใช้น้ำ
5. แสดงสัญลักษณ์ชัดเจน
6. เป็นรูปอาหารและเครื่องดื่ม ควรเป็นหยดน้ำเพื่อดูแล้วน่ารับประทาน ไม่ควรเป็นรูปเท้า ซึ่งคนไทยไม่ชอบเอาเท้ามาโชว์
7. ภาพหยดน้ำสื่อความหมายได้ดีกับการกล่าวถึงเรื่องน้ำ พร้อมทั้งมีค่าปริมาณการใช้น้ำเปรียบเทียบกับค่าเฉลี่ย
8. วัตถุประสงค์ของฉลากคือปริมาณการใช้น้ำ รูป A แสดงข้อมูลได้ชัดเจน รูปเท้าไม่เหมาะสมในการทำฉลากเลยครับ ดูแล้วแปลกๆนะ
9. แบบ A สามารถระบุปริมาณน้ำที่ใช้และค่าเฉลี่ยการใช้น้ำของผลิตภัณฑ์สินค้าชนิดนั้นอย่างชัดเจน รวมทั้งรูปหยดน้ำเป็นโลโก้ ที่คนทั่วโลกเข้าใจความหมายและเป็นสากล
10. เข้าใจง่ายว่าปริมาณที่ใช้ในการผลิตเทียบกับเฉลี่ยต่างกันเพียงไร จะมากน้อยขึ้นอยู่กับผู้บริโภคจะตัดสินใจใช้ผลิตภัณฑ์นั้นๆ รูปหยดน้ำดีกว่ารูปรอยเท้าเพราะเป็นเรื่องของอาหารการกิน
11. เป็นการแสดงถึงการใช้ปริมาณของน้ำ
12. แสดงสัญลักษณ์ให้ชัดเจน
13. เพราะจะได้ทราบว่าสินค้านั้นใช้น้ำในการผลิตจำนวนเท่าใด
14. รูป A แสดงถึงปริมาณการใช้น้ำได้อย่างชัดเจน
15. เห็นชัดว่าเกี่ยวกับน้ำ
16. ดูมีเหตุผลที่สุด
17. ดูดี และเป็นทางการ ตัวเลขดูง่ายและไม่แสดงค่าติดลบ

Type B

1. เป็นจุดสนใจและแปลกให้ระลึกการใช้น้ำ
2. แปลกดี

Type C

1. รูปหยดน้ำแสดงถึงสัญลักษณ์อาหารและเครื่องดื่ม ที่มีคุณภาพ ใสสะอาด

2. เข้าใจง่าย ไม่ต้องแปลความ
3. เป็นรูปหยดน้ำจะสุภาพกว่ารูปเท้า ส่วนตัวเลขจะยังไงก็ได้
4. เพื่อจะได้รู้ถึงปริมาณของน้ำที่ใช้ในอุตสาหกรรมนั้นๆที่จะประหยัดทรัพยากรน้ำ (น้ำต่อหน่วยผลิต)
5. ทราบปริมาณน้ำในการใช้ผลิตสินค้านั้นๆ และโลโก้น่าสนใจ
6. เพราะแสดงการใช้น้ำที่ผลิตในสินค้าแต่ละชนิด
7. รูปหยดน้ำดูดีกว่ารูปเท้าเมื่อไปอยู่บนสินค้า โดยเฉพาะสินค้าบริโภค และการบอกปริมาณน้ำที่ใช้ลดลงจากค่าเฉลี่ยก็ดูเข้าใจง่ายดี

Type E

1. ดูเป็นเปอร์เซ็นต์ง่ายกว่า
2. เท้าคนไทยถือ ไม่ควรใช้ ไม่สุภาพ
3. เข้าใจง่าย
4. ดูแล้วเข้าใจง่ายกว่ารูปอื่น รูปเท้าอาจดูไม่เหมาะสมสำหรับคนไทย
5. รูปหยดน้ำจะมีความเหมาะสมบนผลิตภัณฑ์อาหารและเครื่องดื่ม ส่วนรอยเท้าคนเอเชียถือว่าเป็นของต่ำ และใช้ค่าร้อยละจำนวน ก็จะเหมาะสมและดูการประหยัดการใช้น้ำ
6. เป็นเปอร์เซ็นต์จะเข้าใจง่ายกว่า และรูปรอยเท้าดูแล้วไม่สุภาพ
7. ตัดรูปเท้าออกเพราะไม่สุภาพ และการแสดงเป็นเปอร์เซ็นต์ชัดเจนกว่า
8. เป็นการเปรียบเทียบกับคู่แข่งในตลาดและเป็นร้อยละเพื่อการเปรียบเทียบที่ชัดเจนขึ้น

Type F

1. เพื่อแสดงถึงความเสียหายในระบบการผลิตที่เกิดขึ้น
2. เหตุผลที่เลือกคือ รูปภาพเป็นรอยเท้าน้ำดูแล้วค่อนข้างจะเข้าใจได้ง่าย เพราะตรงตามชื่อ Water Footprint เลย และก็บอกปริมาณของน้ำที่ใช้ลดลงออกมาเป็นค่าของเปอร์เซนต์

No comment

1. ไม่ได้สร้างสรรค์ ขัดต่อหลักการความสมเหตุสมผล

1.3 - 1.6 How much do you want to pay for Water footprint labeled products?

Other

1. เท่าเดิม
2. 31/41/155/93
3. 28/38/144/80
4. ราคาถูกกว่าท้องตลาด

5. ถ้าการบริหารจัดการที่ดี ทำให้ใช้ทรัพยากรลดลง ต้นทุนลดลง ทำไมราคาต้องสูงขึ้น
6. จะให้ราคาสูงต่อเมื่อทราบปริมาณจริงเทียบกับค่าเฉลี่ย

2.2 Why?

Agree

1. เพราะทุกวันนี้ต้องจ่ายเงินเพื่อใช้ในการใช้น้ำกับชีวิตประจำวัน
2. น้ำมีปริมาณน้อยลง แห้งแล้ง
3. ฤดูกาลไม่แน่นอน การตัดไม้ทำลายป่ามีมาก
4. เพื่อให้เกิดการประหยัด
5. ใช้น้ำกันอย่างฟุ่มเฟือย
6. ถ้ารู้จักใช้ น้ำก็จะไม่หมดไป
7. น้ำในโลกลดลง
8. ปริมาณน้ำในโลกถูกใช้มากจึงลดลงมาก ไม่เพียงพอต่อประชากรของโลก
9. แบบสอบถามตั้งคำถามให้คิดมาก ควรตั้งคำถามที่เข้าใจง่ายๆกว่านี้และให้เห็นภาพ ควรใช้คำว่าใช่หรือไม่ใช่ สังคมปัจจุบันไม่มีเวลา ทำอะไรยากๆ
10. เป็นการปลูกจิตสำนึกให้รู้จักใช้ทรัพยากรอย่างคุ้มค่า
11. สมเหตุสมผลดี ทรัพยากรน้ำมีแต่จะหมดไปถ้าไม่มีการจัดการ (บริหารจัดการทรัพยากรน้ำที่ดี)
12. น้ำที่มีคุณภาพสะอาดและเหมาะสมใช้ในการผลิตอาหารและเครื่องดื่มมีอยู่อย่างจำกัด
13. เราควรใช้อย่างประหยัด
14. ในโลกเรามีปริมาณน้ำเท่าเดิมไม่เพิ่มขึ้น แต่ผู้บริโภคเพิ่มขึ้นตลอดเวลา
15. มีความรู้อยู่ก่อนแล้วว่าเหตุใดน้ำจึงมีอยู่อย่างจำกัด
16. จากสภาพภูมิอากาศของโลกเปรียบเทียบจากอดีตถึงปัจจุบัน จะเห็นปรากฏการณ์ที่ชัดเจนว่าน้ำเริ่มลดน้อยลง หิมะเริ่มละลาย อากาศของโลกร้อนขึ้นเรื่อยๆ
17. น้ำเป็นทรัพยากรธรรมชาติ แต่เป็นน้ำที่มีคุณภาพหรือมีคุณประโยชน์นั้นต้องผ่านกระบวนการต่างๆ ซึ่งทำให้มีจำกัด
18. น้ำเป็นสิ่งจำเป็น ในบางพื้นที่ก็หายากและมีค่ามาก แม้ในบางพื้นที่จะหาได้ไม่ยากแต่ก็ควรปลูกจิตสำนึกให้คนรู้คุณค่าของสิ่งจำเป็นในการดำรงชีวิตนี้ รู้จักใช้อย่างประหยัดและรักษาธรรมชาติ เพื่อจะได้มีน้ำใช้ตลอดไม่ขาดแคลน
19. ปัจจุบันจะเห็นว่าทรัพยากรน้ำลดลงเรื่อยๆ เนื่องจากพฤติกรรมมนุษย์ เช่น ตัดไม้ทำลายป่า ทำให้ไม่มีต้นไม้ และส่งผลกระทบต่อ แหล่งน้ำ
20. ควรใช้น้ำอย่างประหยัด
21. ใช้กันอย่างฟุ่มเฟือย

22. ในปัจจุบันปริมาณทรัพยากรน้ำยังคงอยู่เท่าเดิม
แต่ปริมาณการใช้กลับเพิ่มขึ้นตามจำนวนของผู้บริโภค
23. น้ำเป็นทรัพยากรที่เกิดขึ้นตามธรรมชาติ เมื่อสภาพแวดล้อมเริ่มลดน้อยลง
น้ำก็ย่อมลดน้อยลงเช่นกัน
24. ใช้น้ำเท่าที่จำเป็นและประหยัดจะมีน้ำใช้ถึงรุ่นลูกหลาน
25. เพราะถ้าใช้น้ำอย่างประหยัดก็จะมีใช้ตลอดไป
ถ้าใช้อย่างไม่จำกัดก็จะทำให้น้ำที่ใช้ลดลงไปทุกๆปี
26. เห็นจากข่าวภัยแล้ง
27. เห็นได้จากภัยแล้งที่เกิดขึ้นในปัจจุบัน
28. เนื่องจากปริมาณน้ำในโลกที่มีอยู่เป็นที่ทราบกันดีอยู่แล้วว่าน้ำเค็มมีปริมาณมากกว่าน้ำจืด
และเนื่องจากปัจจุบันมีปัญหาเรื่องภัย ธรรมชาติที่ค่อนข้างรุนแรง
ทำให้บางพื้นที่ภายในประเทศค่อนข้างแห้งแล้ง ไม่มีน้ำใช้
จึงมีความจำเป็นที่ต้องใช้น้ำอย่างประหยัด
29. มันขึ้นกับสภาพแวดล้อม
30. น้ำโดยปกติต้องผ่านกระบวนการถึงจะเอามากิน มาใช้ได้ ซึ่งกระบวนการเหล่านี้มีต้นทุน
ถ้าวันนึงต้นทุนหมดไป น้ำก็หมดเหมือนกัน

Disagree

1. ปริมาณน้ำในโลกมีถึง 2/3 ของโลก หากอยู่ที่การบริหารจัดการต่างหาก
2. น้ำสามารถนำกลับมาใช้ใหม่ได้ ด้วยเทคโนโลยีในปัจจุบัน
3. ควรเป็น "น้ำสะอาดเป็นทรัพยากรที่มีอยู่อย่างจำกัด"

No comment

1. คิดว่าในอนาคตเทคโนโลยีจะสามารถช่วยผลิต/reuseได้ แต่ก็ควรใช้น้ำอย่างคุ้มค่ามากที่สุด เพราะบางแห่งสูบน้ำมาใช้จากใต้ดิน ทำให้มีผลกระทบต่ออย่างอื่นไปด้วย

2.5 Why?

Agree

1. เพราะว่าทำอะไรทุกวันนี้ก็ต้องใช้น้ำในการดำรงชีวิต ใช้ดื่ม ล้างต่างๆในแต่ละวัน
2. ใช้ในการเพาะปลูก
3. น้ำเป็นส่วนสำคัญในการเกษตร
4. คือเป็นเหมือนลูกโซ่ต่อๆกันไป
5. เป็นปัจจัยสำคัญ
6. น้ำเป็นปัจจัยหลักในการดำรงชีวิต
7. น้ำเป็นเครื่องหล่อเลี้ยงทำให้เกิดอาหาร
8. น้ำเป็นปัจจัยสำคัญของการดำรงชีวิต
9. เพราะน้ำจำเป็นต่อเกษตรกรรมและการผลิตอาหาร ถ้าขาดน้ำต้องขาดอาหาร
10. น้ำเป็นส่วนหนึ่งของขบวนการผลิต ทั้งภาควัตถุดิบและภาคการผลิต
11. น้ำเป็นสิ่งสำคัญ มีส่วนช่วยในการดำรงชีวิตของพืชและสัตว์ เหมือนห่วงโซ่อาหาร ต้องพึ่งพาอาศัยกันและกัน
12. น้ำเป็นส่วนประกอบของอาหาร การผลิตอาหารต้องใช้น้ำ น้ำเป็นส่วนสำคัญ พื้นที่ที่แห้งแล้งไม่สามารถเป็น/ทำการเกษตรได้
13. เพราะถ้าเราไม่ช่วยกันประหยัดก็จะทำให้ทรัพยากรหมดไป
14. น้ำเป็นส่วนประกอบอย่างหนึ่งในสิ่งที่มีชีวิตทั้งหลาย เช่น พืช สัตว์และคน สัตว์บางชนิดเป็นอาหารของคน เมื่อสัตว์หรืออาหารของคน ขาดน้ำทำให้ตายได้ ก็จะทำให้คนไม่มีอาหารรับประทาน
15. น้ำเป็นปัจจัยสำคัญในภาคการเกษตร ซึ่งเป็นแหล่งอาหารสำคัญของโลก
16. น้ำเป็นองค์ประกอบสำคัญของอาหารและการจัดการเพื่อให้มีอาหาร
17. เพราะอาหารทุกชนิดต้องมีน้ำเป็นส่วนประกอบ ยกเว้นประเภทย่าง เผา และอบ เท่านั้น
18. เพราะน้ำเป็นส่วนประกอบหนึ่งของอาหารทุกชนิด
19. น้ำเป็นสิ่งจำเป็นในการเพาะปลูก ซึ่งเป็นแหล่งอาหารเบื้องต้นของสิ่งมีชีวิต

20. น้ำเป็นสิ่งจำเป็นในการดำรงชีวิต
21. น้ำเป็นส่วนประกอบของร่างกายและจำเป็นต่อชีวิตประจำวัน
22. พืชขาดน้ำก็ตาย เมื่อตายก็ไม่มีกิน
23. เห็นด้วยเนื่องจากน้ำเป็นปัจจัยหลักในภาคการเกษตร
    หากขาดแคลนน้ำการผลิตสินค้าเกษตรก็ไม่เกิดขึ้น จึงเป็นปัจจัยทำให้ ขาดแคลนอาหาร
24. น้ำเป็นทรัพยากรธรรมชาติที่ใช้ในการดำรงชีวิตของมนุษย์
25. น้ำมีคุณค่ากับสิ่งมีชีวิตบนโลกใบนี้ทุกชนิด
26. น้ำเป็นสิ่งจำเป็นในชีวิต
27. น้ำเป็นปัจจัยหนึ่งในการประกอบอาหารชนิดต่างๆ
28. กระบวนการทำอาหารจำเป็นต้องใช้น้ำเป็นส่วนประกอบ
29. เพราะสิ่งมีชีวิตบนโลกต้องการน้ำเป็นส่วนประกอบทั้งนั้น
30. น้ำเป็นส่วนประกอบในการทำอาหาร
31. น้ำคือชีวิต
32. น้ำเป็นส่วนประกอบสำคัญของอาหารทุกชนิด
    แม้แต่อาหารแห้งในขั้นตอนกระบวนการผลิตก็ล้วนต้องใช้น้ำทั้งสิ้น
33. เพราะอาหารส่วนใหญ่บนโลกใช้น้ำเป็นหลักในการผลิต
34. น้ำเป็นแหล่งช่วยให้แหล่งอาหารของเรามีการออกผลผลิตและเจริญเติบโต

Disagree

1. เพราะเมืองไทยมีสุภาษิตมีข้าวในนามีปลาในน้ำ
2. น้ำสำคัญมากกว่า ขาดน้ำตายเร็วกว่าขาดอาหาร
3. ขาดน้ำไม่ได้ แต่ขาดอาหารได้
4. คนเราขาดอาหารได้แต่ไม่สามารถขาดน้ำได้

Comment/suggestion

1. ถ้าติดฉลาก Water Footprint ก็ควรทำให้ดูสะอาด
   รวมถึงวัสดุที่ใช้ในการผลิตดูแล้วต้องสะอาดและปลอดภัย
2. มีความจริงใจในการผลิต ตั้งใจทำจริง ไม่ใช่เป็นการโฆษณา
3. แบบสอบถามยากเกินไปและมากไปสำหรับการสอบถาม
4. ต้องการให้รณรงค์อย่างจริงจังในการใช้น้ำและสิ่งแวดล้อม
5. การปิดฉลากอาจใช้ได้กับคนบางกลุ่มเท่านั้น
   เพราะความสำคัญที่แท้จริงอยู่ที่คุณภาพและราคาของสินค้า ว่าคุ้มค่ากับเงินที่เสียไปหรือไม่

คนซื้อส่วนใหญ่ต้องการถูกและดี โดยเฉพาะกลุ่มแม่บ้าน สิ่งที่ดึงดูดความสนใจได้มากคือคำว่า "ลดราคา"

6. ควรจะเป็นการช่วยเหลือประชาชนโดยตรงทางด้านค่าครองชีพและราคาสินค้าต้องถูกกว่าท้องตลาด มันถึงจะเร้าใจประชาชน

7. บางคำถามไม่สามารถแสดงความเห็นได้
เนื่องจากยังขาดความรู้เกี่ยวกับความเชื่อมโยงข้อมูลและบริษัทของน้ำกับกระบวนการผลิตอาหาร
ผลกระทบจากการลดการใช้น้ำต่อการเพิ่มขึ้นหรือลดลงของการใช้ทรัพยากรอื่นในกระบวนการนั้น

8. รัฐควรสนับสนุนให้ทุกผลิตภัณฑ์ติดฉลาก

9. ไม่ควรใช้ฉลากเป็นเท้า คนไทยถือว่าไม่สุภาพ

10. ปกติจะไม่ค่อยใส่ใจกับสินค้าที่เป็นมิตรกับสิ่งแวดล้อมเท่าไร
แต่ต่อไปจะพยายามซื้อสินค้าที่มีฉลากเป็นมิตรกับสิ่งแวดล้อมให้มากขึ้น

11. แบรนด์ Water footprint ควรจะถูกโปรโมทให้เป็นที่รู้จักและน่าเชื่อถือ
ผู้คนทั่วไปจะได้ใส่ใจกับแบรนด์นี้และช่วยกันรักษาทรัพยากรน้ำ

1.5 SPSS Output (German)

Table 3.1: Cross-tabulation and χ^2 test of logo and gender

Logo * Gender Kreuztabelle

			Gender		
			Female	Male	Gesamt
Logo	Footprint	Anzahl	10	8	18
		Erwartete Anzahl	10,8	7,2	18,0
		% innerhalb von Gender	12,3%	14,8%	13,3%
	None	Anzahl	1	8	9
		Erwartete Anzahl	5,4	3,6	9,0
		% innerhalb von Gender	1,2%	14,8%	6,7%
	Water drop	Anzahl	70	38	108
		Erwartete Anzahl	64,8	43,2	108,0
		% innerhalb von Gender	86,4%	70,4%	80,0%
Gesamt		Anzahl	81	54	135
		Erwartete Anzahl	81,0	54,0	135,0
		% innerhalb von Gender	100,0%	100,0%	100,0%

Chi-Quadrat-Tests

	Wert	df	Asymptotische Signifikanz (2-seitig)
Chi-Quadrat nach Pearson	10,154[a]	2	,006
Likelihood-Quotient	10,609	2	,005
Anzahl der gültigen Fälle	135		

a. 1 Zellen (16,7%) haben eine erwartete Häufigkeit kleiner 5. Die minimale erwartete Häufigkeit ist 3,60.

Table 3.2: Cross-tabulation and χ^2 test of logo and income per month

Logo * Income_pro_month Kreuztabelle

			Income_pro_month				
			30,001 - 80,000	Less than 30,001	More than 80,000	None	Gesamt
Logo	Footprint	Anzahl	8	4	6	0	18
		Erwartete Anzahl	7,9	6,1	3,9	,1	18,0
		% innerhalb von Income_pro_month	13,6%	8,7%	20,7%	,0%	13,3%
	None	Anzahl	1	4	3	1	9
		Erwartete Anzahl	3,9	3,1	1,9	,1	9,0
		% innerhalb von Income_pro_month	1,7%	8,7%	10,3%	100,0%	6,7%
	Water drop	Anzahl	50	38	20	0	108
		Erwartete Anzahl	47,2	36,8	23,2	,8	108,0
		% innerhalb von Income_pro_month	84,7%	82,6%	69,0%	,0%	80,0%
Gesamt		Anzahl	59	46	29	1	135
		Erwartete Anzahl	59,0	46,0	29,0	1,0	135,0
		% innerhalb von Income_pro_month	100,0%	100,0%	100,0%	100,0%	100,0%

Chi-Quadrat-Tests

	Wert	df	Asymptotische Signifikanz (2-seitig)
Chi-Quadrat nach Pearson	19,628[a]	6	,003
Likelihood-Quotient	11,826	6	,066
Anzahl der gültigen Fälle	135		

a. 7 Zellen (58,3%) haben eine erwartete Häufigkeit kleiner 5. Die minimale erwartete Häufigkeit ist ,07.

Table 3.3: Cross-tabulation and χ^2 test of format and gender

Format * Gender Kreuztabelle

			Gender		
			Female	Male	Gesamt
Format	Absolute	Anzahl	37	18	55
		Erwartete Anzahl	33,0	22,0	55,0
		% innerhalb von Gender	45,7%	33,3%	40,7%
	None	Anzahl	1	8	9
		Erwartete Anzahl	5,4	3,6	9,0
		% innerhalb von Gender	1,2%	14,8%	6,7%
	Percent	Anzahl	27	18	45
		Erwartete Anzahl	27,0	18,0	45,0
		% innerhalb von Gender	33,3%	33,3%	33,3%
	Reduction	Anzahl	16	10	26
		Erwartete Anzahl	15,6	10,4	26,0
		% innerhalb von Gender	19,8%	18,5%	19,3%
Gesamt		Anzahl	81	54	135
		Erwartete Anzahl	81,0	54,0	135,0
		% innerhalb von Gender	100,0%	100,0%	100,0%

Chi-Quadrat-Tests

	Wert	df	Asymptotische Signifikanz (2-seitig)
Chi-Quadrat nach Pearson	10,201[a]	3	,017
Likelihood-Quotient	10,671	3	,014
Anzahl der gültigen Fälle	135		

a. 1 Zellen (12,5%) haben eine erwartete Häufigkeit kleiner 5. Die minimale erwartete Häufigkeit ist 3,60.

Table 3.4: Cross-tabulation and χ^2 test of format and income per month

Format * Income_pro_month Kreuztabelle

			Income_pro_month				
			30,001 - 80,000	Less than 30,001	More than 80,000	None	Gesamt
Format	Absolute	Anzahl	26	18	11	0	55
		Erwartete Anzahl	24,0	18,7	11,8	,4	55,0
		% innerhalb von Income_pro_month	44,1%	39,1%	37,9%	,0%	40,7%
	None	Anzahl	1	4	3	1	9
		Erwartete Anzahl	3,9	3,1	1,9	,1	9,0
		% innerhalb von Income_pro_month	1,7%	8,7%	10,3%	100,0%	6,7%
	Percent	Anzahl	23	13	9	0	45
		Erwartete Anzahl	19,7	15,3	9,7	,3	45,0
		% innerhalb von Income_pro_month	39,0%	28,3%	31,0%	,0%	33,3%
	Reduction	Anzahl	9	11	6	0	26
		Erwartete Anzahl	11,4	8,9	5,6	,2	26,0
		% innerhalb von Income_pro_month	15,3%	23,9%	20,7%	,0%	19,3%
Gesamt		Anzahl	59	46	29	1	135
		Erwartete Anzahl	59,0	46,0	29,0	1,0	135,0
		% innerhalb von Income_pro_month	100,0%	100,0%	100,0%	100,0%	100,0%

Chi-Quadrat-Tests

	Wert	df	Asymptotische Signifikanz (2-seitig)
Chi-Quadrat nach Pearson	19,311[a]	9	,023
Likelihood-Quotient	11,546	9	,240
Anzahl der gültigen Fälle	135		

a. 7 Zellen (43,8%) haben eine erwartete Häufigkeit kleiner 5. Die minimale erwartete Häufigkeit ist ,07.

Table 3.5: Cross-tabulation and χ^2 test of WTP for PWFL eggs and income per month

WTP_Eggs * Income_pro_month_WTP Kreuztabelle

			Income_pro_month_WTP			
			Less than 30,001	More than 30,000	None	Gesamt
WTP_Eggs	10% or more	Anzahl	26	52	0	78
		Erwartete Anzahl	26,6	50,8	,6	78,0
		% innerhalb von Income_pro_month_WTP	56,5%	59,1%	,0%	57,8%
	less than 10%	Anzahl	14	24	0	38
		Erwartete Anzahl	12,9	24,8	,3	38,0
		% innerhalb von Income_pro_month_WTP	30,4%	27,3%	,0%	28,1%
	None	Anzahl	6	12	1	19
		Erwartete Anzahl	6,5	12,4	,1	19,0
		% innerhalb von Income_pro_month_WTP	13,0%	13,6%	100,0%	14,1%
Gesamt		Anzahl	46	88	1	135
		Erwartete Anzahl	46,0	88,0	1,0	135,0
		% innerhalb von Income_pro_month_WTP	100,0%	100,0%	100,0%	100,0%

Chi-Quadrat-Tests

	Wert	df	Asymptotische Signifikanz (2-seitig)
Chi-Quadrat nach Pearson	6,300[a]	4	,178
Likelihood-Quotient	4,116	4	,391
Anzahl der gültigen Fälle	135		

a. 3 Zellen (33,3%) haben eine erwartete Häufigkeit kleiner 5. Die minimale erwartete Häufigkeit ist ,14.

Table 3.6: Cross-tabulation and χ^2 test of WTP for PWFL eggs and frequency of buying eco-labeled products

WTP_Eggs * Buying_Ecoproducts Kreuztabelle

			Buying_Ecoproducts				
			Hardly	None	Often	Sometimes	Gesamt
WTP_Eggs	10%	Anzahl	18	1	25	16	60
		Erwartete Anzahl	15,6	1,8	19,6	23,1	60,0
		% innerhalb von Buying_Ecoproducts	51,4%	25,0%	56,8%	30,8%	44,4%
	less than 10%	Anzahl	9	2	10	17	38
		Erwartete Anzahl	9,9	1,1	12,4	14,6	38,0
		% innerhalb von Buying_Ecoproducts	25,7%	50,0%	22,7%	32,7%	28,1%
	more than 10%	Anzahl	3	1	3	11	18
		Erwartete Anzahl	4,7	,5	5,9	6,9	18,0
		% innerhalb von Buying_Ecoproducts	8,6%	25,0%	6,8%	21,2%	13,3%
	None	Anzahl	5	0	6	8	19
		Erwartete Anzahl	4,9	,6	6,2	7,3	19,0
		% innerhalb von Buying_Ecoproducts	14,3%	,0%	13,6%	15,4%	14,1%
Gesamt		Anzahl	35	4	44	52	135
		Erwartete Anzahl	35,0	4,0	44,0	52,0	135,0
		% innerhalb von Buying_Ecoproducts	100,0%	100,0%	100,0%	100,0%	100,0%

Chi-Quadrat-Tests

	Wert	df	Asymptotische Signifikanz (2-seitig)
Chi-Quadrat nach Pearson	11,444[a]	9	,246
Likelihood-Quotient	12,029	9	,212
Anzahl der gültigen Fälle	135		

a. 6 Zellen (37,5%) haben eine erwartete Häufigkeit kleiner 5. Die minimale erwartete Häufigkeit ist ,53.

Table 3.7: Cross-tabulation and χ^2 test of WTP for PWFL eggs and WTP for PWFL milk

WTP_Eggs * WTP_milk Kreuztabelle

			WTP_milk				
			10%	less than 10%	more than 10%	None	Gesamt
WTP_Eggs	10%	Anzahl	55	0	2	3	60
		Erwartete Anzahl	26,7	16,4	7,1	9,8	60,0
		% innerhalb von WTP_milk	91,7%	,0%	12,5%	13,6%	44,4%
	less than 10%	Anzahl	0	36	0	2	38
		Erwartete Anzahl	16,9	10,4	4,5	6,2	38,0
		% innerhalb von WTP_milk	,0%	97,3%	,0%	9,1%	28,1%
	more than 10%	Anzahl	4	0	14	0	18
		Erwartete Anzahl	8,0	4,9	2,1	2,9	18,0
		% innerhalb von WTP_milk	6,7%	,0%	87,5%	,0%	13,3%
	None	Anzahl	1	1	0	17	19
		Erwartete Anzahl	8,4	5,2	2,3	3,1	19,0
		% innerhalb von WTP_milk	1,7%	2,7%	,0%	77,3%	14,1%
Gesamt		Anzahl	60	37	16	22	135
		Erwartete Anzahl	60,0	37,0	16,0	22,0	135,0
		% innerhalb von WTP_milk	100,0%	100,0%	100,0%	100,0%	100,0%

Chi-Quadrat-Tests

	Wert	df	Asymptotische Signifikanz (2-seitig)
Chi-Quadrat nach Pearson	292,527[a]	9	,000
Likelihood-Quotient	249,716	9	,000
Anzahl der gültigen Fälle	135		

a. 6 Zellen (37,5%) haben eine erwartete Häufigkeit kleiner 5. Die minimale erwartete Häufigkeit ist 2,13.

Table 3.8: Cross-tabulation and χ^2 test of interest on eco-label and occupation

Interest_on_Ecolabel * Occupation Kreuztabelle

			Occupation				
			Civil	None	Private	Unemploy	Gesamt
Interest_on_Ecolabel	Disinterest	Anzahl	10	0	7	2	19
		Erwartete Anzahl	4,9	,3	9,7	4,1	19,0
		% innerhalb von Occupation	28,6%	,0%	10,1%	6,9%	14,1%
	Interest	Anzahl	16	2	36	12	66
		Erwartete Anzahl	17,1	1,0	33,7	14,2	66,0
		% innerhalb von Occupation	45,7%	100,0%	52,2%	41,4%	48,9%
	Mixed feeling	Anzahl	9	0	26	15	50
		Erwartete Anzahl	13,0	,7	25,6	10,7	50,0
		% innerhalb von Occupation	25,7%	,0%	37,7%	51,7%	37,0%
Gesamt		Anzahl	35	2	69	29	135
		Erwartete Anzahl	35,0	2,0	69,0	29,0	135,0
		% innerhalb von Occupation	100,0%	100,0%	100,0%	100,0%	100,0%

Chi-Quadrat-Tests

	Wert	df	Asymptotische Signifikanz (2-seitig)
Chi-Quadrat nach Pearson	12,603[a]	6	,050
Likelihood-Quotient	12,468	6	,052
Anzahl der gültigen Fälle	135		

a. 5 Zellen (41,7%) haben eine erwartete Häufigkeit kleiner 5. Die minimale erwartete Häufigkeit ist ,28.

Table 3.9: Cross-tabulation and χ^2 test of interest on eco-label and income per month

Interest_on_Ecolabel * Income_pro_month Kreuztabelle

			Income_pro_month				Gesamt
			30,001 - 80,000	Less than 30,001	More than 80,000	None	
Interest_on_Ecolabel	Disinterest	Anzahl	12	5	2	0	19
		Erwartete Anzahl	8,3	6,5	4,1	,1	19,0
		% innerhalb von Income_pro_month	20,3%	10,9%	6,9%	,0%	14,1%
	Interest	Anzahl	34	17	14	1	66
		Erwartete Anzahl	28,8	22,5	14,2	,5	66,0
		% innerhalb von Income_pro_month	57,6%	37,0%	48,3%	100,0%	48,9%
	Mixed feeling	Anzahl	13	24	13	0	50
		Erwartete Anzahl	21,9	17,0	10,7	,4	50,0
		% innerhalb von Income_pro_month	22,0%	52,2%	44,8%	,0%	37,0%
Gesamt		Anzahl	59	46	29	1	135
		Erwartete Anzahl	59,0	46,0	29,0	1,0	135,0
		% innerhalb von Income_pro_month	100,0%	100,0%	100,0%	100,0%	100,0%

Chi-Quadrat-Tests

	Wert	df	Asymptotische Signifikanz (2-seitig)
Chi-Quadrat nach Pearson	13,258[a]	6	,039
Likelihood-Quotient	14,055	6	,029
Anzahl der gültigen Fälle	135		

a. 4 Zellen (33,3%) haben eine erwartete Häufigkeit kleiner 5. Die minimale erwartete Häufigkeit ist ,14.

Table 3.10: Cross-tabulation and χ^2 test of buying eco-labeled products and income per month

Buying_Ecoproducts * Income_pro_month Kreuztabelle

			Income_pro_month				Gesamt
			30,001 - 80,000	Less than 30,001	More than 80,000	None	
Buying_Ecoproducts	Hardly	Anzahl	15	12	8	0	35
		Erwartete Anzahl	15,3	11,9	7,5	,3	35,0
		% innerhalb von Income_pro_month	25,4%	26,1%	27,6%	,0%	25,9%
	None	Anzahl	3	1	0	0	4
		Erwartete Anzahl	1,7	1,4	,9	,0	4,0
		% innerhalb von Income_pro_month	5,1%	2,2%	,0%	,0%	3,0%
	Often	Anzahl	20	14	9	1	44
		Erwartete Anzahl	19,2	15,0	9,5	,3	44,0
		% innerhalb von Income_pro_month	33,9%	30,4%	31,0%	100,0%	32,6%
	Sometimes	Anzahl	21	19	12	0	52
		Erwartete Anzahl	22,7	17,7	11,2	,4	52,0
		% innerhalb von Income_pro_month	35,6%	41,3%	41,4%	,0%	38,5%
Gesamt		Anzahl	59	46	29	1	135
		Erwartete Anzahl	59,0	46,0	29,0	1,0	135,0
		% innerhalb von Income_pro_month	100,0%	100,0%	100,0%	100,0%	100,0%

Chi-Quadrat-Tests

	Wert	df	Asymptotische Signifikanz (2-seitig)
Chi-Quadrat nach Pearson	4,361[a]	9	,886
Likelihood-Quotient	5,245	9	,812
Anzahl der gültigen Fälle	135		

a. 7 Zellen (43,8%) haben eine erwartete Häufigkeit kleiner 5. Die minimale erwartete Häufigkeit ist ,03.

Table 3.11: Cross-tabulation and χ^2 test of buying eco-labeled products and age

Buying_Ecoproducts * Age Kreuztabelle

			Age			
			35-44	Less than 35	More than 44	Gesamt
Buying_Ecoproducts	Hardly	Anzahl	5	20	10	35
		Erwartete Anzahl	7,8	13,0	14,3	35,0
		% innerhalb von Age	16,7%	40,0%	18,2%	25,9%
	None	Anzahl	2	2	0	4
		Erwartete Anzahl	,9	1,5	1,6	4,0
		% innerhalb von Age	6,7%	4,0%	,0%	3,0%
	Often	Anzahl	11	10	23	44
		Erwartete Anzahl	9,8	16,3	17,9	44,0
		% innerhalb von Age	36,7%	20,0%	41,8%	32,6%
	Sometimes	Anzahl	12	18	22	52
		Erwartete Anzahl	11,6	19,3	21,2	52,0
		% innerhalb von Age	40,0%	36,0%	40,0%	38,5%
Gesamt		Anzahl	30	50	55	135
		Erwartete Anzahl	30,0	50,0	55,0	135,0
		% innerhalb von Age	100,0%	100,0%	100,0%	100,0%

Chi-Quadrat-Tests

	Wert	df	Asymptotische Signifikanz (2-seitig)
Chi-Quadrat nach Pearson	13,437[a]	6	,037
Likelihood-Quotient	14,696	6	,023
Anzahl der gültigen Fälle	135		

a. 3 Zellen (25,0%) haben eine erwartete Häufigkeit kleiner 5. Die minimale erwartete Häufigkeit ist ,89.

Annex 2: Open questions

2.1 United Nations Environment Programme (UNEP): Dr. Maite Aldaya

Basic information of the expert and the water footprint

1.1 Could you please give me brief information with regard to your experience?
I am a water footprint researcher, now working as a consultant for UNEP Paris.

1.2 What is the current situation of water footprint? How many people or businesses know about water footprint?
The broad interest in the water footprint concept and methodology has taken off in September 2007 with a small meeting between representatives from civil society, business, academia and the UN. Since then, the interest in applying the water footprint in governmental policy and corporate strategy has been growing continuously. This has led to the establishment of the WFN on 16 October 2008. Twelve month later, the network had 76 partners, coming from all continents and from all sorts of sectors: government, business, investors, civil society, intergovernmental institutions, consultants, universities and research institutes. Precisely two years after the establishment of the WFN, the network had 130 partners. A major challenge is to maintain a shared language in the field of water footprint assessment, because concrete targets towards sustainable water resources use can only be transparent, meaningful and effective when formulated in a common terminology and based on a shared calculation methodology. This water footprint assessment manual provides such a common base.

1.3 How many companies already conducted an assessment of their water footprint or disclose it on the annual and/or sustainable report? And how many of them are businesses in the food and beverage sector?
The Coca Cola Company, SABMiller, Unilever, Nestlé, PepsiCo, UPM, C&A, Natura, Concha & Toro, Dole and others.

1.4 What are their motivations to calculate water footprint of their products or service?
Good information about water footprints of communities and businesses will help to understand how we can achieve a more sustainable and equitable use of fresh water. The water footprint helps to show the link that exists between our daily consumption of goods and the problems of water depletion and pollution that exist elsewhere, in the regions where our goods are produced. Nearly every product has a smaller or larger water footprint, which is of interest for both consumers that buy those products and businesses that produce, process, trade or sell those products in some stage of their supply chain.

First of all, environmental awareness and strategy is often part of what a business regards as its 'corporate social responsibility'. Reducing the water footprint can be part of the environmental strategy of a business, just like reducing the carbon footprint. Second, many businesses actually face serious risks related to freshwater shortage in their operations or supply chain. What is a brewery without secure water supply or how can a company in jeans survive without continued supply of water to the cotton fields? A third reason to do water footprint accounting and formulate measures to reduce the corporate water footprint is to anticipate regulatory control by governments. In the current stage it is not so clear how governments will respond, but obviously regulations in some sectors

of business may be expected. Finally, some businesses see a corporate water footprint strategy also as an instrument to reinforce the corporate image or to strengthen the brand name.

Water footprint assessment

1.5 Do you think that a single scheme would work across all food and drink on a universal basis, i.e. the same standard to apply regardless of product?
The increased use of the water footprint in practical contexts in the past few years has contributed to maturing of the concept. Nevertheless, various challenges remain, including the development of practical guidelines per product category and business sector on how to truncate the analysis (where to stop going back along supply chains) and rules on how to account for uncertainties and how to deal with time variability when doing trend analysis. Besides, there is a huge challenge to develop databases on typical process water footprints (the basic ingredient for each analysis) and software tools to make it easier for practitioners to set up a water footprint account. Following the guidelines on water footprint accounting is much more labor-intensive than when one could use a simple computer tool guiding the analysis. Developing such a tool together with underlying databases is therefore part of the work program of the Water Footprint Network (WFN).

1.6 Regarding your experience, what are differences and similarities between carbon footprint and water footprint with regard to calculation method?
The two concepts nicely complement each other, each concept addressing another environmental issue: the carbon footprint addresses the issue of climate change, the water footprint relates to the issue of freshwater scarcity. In both cases, a supply-chain perspective is promoted. The water footprint concept is part of a larger family of concepts that have been developed in the environmental sciences over the past decade. A 'footprint' in general has become known as a quantitative measure showing the appropriation of natural resources or pressure on the environment by human beings. There are also differences, however. For a carbon emission it doesn't matter where it happens, but for a water footprint is does matter. A carbon emission in one place can be offset by carbon emission reduction or sequestration in another place, which is not true for water: one cannot reduce the local impact of water use in one place by saving water in another place.

Product Water footprint Labeling

1.7 What are the main factors in order to launch the water footprint label on a product?
In a world where many producers are related to water depletion and pollution it is very useful to make the history of products more transparent. It is good to have the facts publicly available, so the consumer has a choice. Information can be provided on a label or can be made available through the Internet. This is most useful for products that are often associated with large effects on water, such as products that contain cotton or sugar. For consumers it would be helpful to integrate a water label in broader labels that include other issues as well, such as energy and fair trade. Ideal would be a world without labels because we can trust that all products meet strict criteria. If a water label is considered, the question is what should be on the label. One could put the total water footprint of the product on a label, which is functional only for raising awareness among consumers, not

for enabling the consumer to make a well-informed choice between two products. For supporting good product choice, one would also need to specify the green-blue-grey components and mention the degree in which the product's water footprint relates to violation of local environmental flow requirements or ambient water quality standards. For example, three quarters of the water footprint is situated in areas where environmental flow requirements or ambient water quality standards are met, but the other quarter of the total water footprint is in areas where those norms are violated. Whether a product is 'good' or not from a water resource point of view depends on a whole range of criteria, including whether plans are in place to achieve continued improvements along the production chain. In the end, labeling of products is a partial solution at best. As a means of awareness-raising and basis for product choice, it can be functional, but it is just one way of providing product transparency, restricted by the practical problem that a label can contain limited information only. Besides, real water footprint reduction will not occur just by providing information on a label.

1.8 In your opinion, what information should be displayed on the water footprint label? For example, only blue water footprint should be shown on the water footprint label or three kinds of water footprint?
In my opinion, the label should include information not only about the volume but also about the impact of the water use. Relevant information may include for instance answers to questions such as: how much water was consumed to make the product in the different stages of its supply chain, how much water was polluted, what type of pollution, does the water consumption or pollution takes place in areas where water is relatively scarce and already polluted beyond acceptable limits, are downstream users or ecosystems negatively affected, could the water consumed have been used for an alternative purpose with a higher societal benefit, etc. Furthermore, for consumers it would be helpful to integrate a water label in broader labels that include other issues as well, like energy and fair trade.

1.9 Some researchers say that disclosure water footprint of a product in the annual and/or sustainable report is better than attach a label on the product because of complexity of water footprint which consists of three kinds of water. A label on a product does not have enough space to inform the environmental impacts that caused from each kind of water footprint. What do you think about that?
In my view, the aim of the sustainability report and WF label is different. Some consumers do not have the time to read the whole report and would need a summary of the relevant information when making quick consumption choices. The report could be available online for those consumers and other stakeholders interested.

<u>End effect of the water footprint label</u>

1.10 In your opinion, Product Water Footprint Labeling can force food and beverage producers to use less water than usual, which lead to the end effect that water resource is used more sustainable?
In my opinion product WF labeling would provide consumers proper information to make consumption choices, which could ultimately lead to a more sustainable water resource use.

2.2 Water Footprint Network (WFN): Dr. Erika Zarate Torres

1.1 Which incentives from the government do you consider necessary to further promote the water footprint labeling concept?
A government can decide that WF labeling is one of the strategies to achieve water footprint reductions. The way forward is still long because governments still need to fully understand the water footprint concept and the links between water footprints and water scarcity. So the best incentive would be to understand that there is indeed a link between water footprints and water scarcity.

1.2 What would be your organizations role, as the Water Footprint Network, in order to support water footprint label on a product?
We would not develop any product label. However if someone is willing to do so and require advice from the technical point of view on the water footprint information, we would be willing to support.

1.3 In your opinion, Product Water Footprint Labeling can force food and beverage producers to use less water than usual, which lead to the end effect that water resource is used more sustainable as well as food security for other stakeholders?
I am not so sure of this one, I rather think the label is a powerful awareness-raising tool for all consumers. If consumers have this information, they are better informed to choose the products they prefer. All this in turn would force producers to find ways to use less water in their production chains, so they could get the label.

Annex 3: In-depth Expert-Interview (summary)

3.1 Charoen Pokphand Foods PCL.: Mrs. Kularb Kimsri

Position:	Assistant of Vice President
Website:	http://www.cpfworldwide.com/index_en.aspx
Date:	10th March 2011
Place:	Ramada Plaza Hotel, Budapest, Hungary

Basic information about the company and the interviewee

1.1 Could you please provide me some basic information about your company?

Charoen Pokphand Foods Public Company Limited ("CPF") and its subsidiaries are the leading agro-industrial and food conglomerate in Thailand. We are dedicated to continuous research and development and to delivering the safest and highest quality food products. CPF produces food and has its own value chain, which is feed, breed, farm and food. We also produce animal feed for our own farms, which include chicken, duck, swine, shrimp and fish. As a result, we know very well about the life cycle of food products, which makes it easy to manage our value chain. According to our annual report for 2010, revenue is 165,063 million Baht and net profit is 10,190 million Baht. Our business growth depends on the growth of the food market. Our president, Mr. Dhanin Chearavanont, is committed to making CPF "Kitchen of the World" by meeting the needs of global consumers and supplying them with nutritious protein sources and safe food products. Social and environmental values are included in our policy. We take care of communities near our factories so that every town is not affected or disturbed by our operation, such as by noise or pollution. From the environmental aspect, we are certified by ISO 14001, which guarantees that we constantly conduct environmental risk assessment. Now we are seriously concerned with two issues, reduction of pollution and saving energy. CPF is the biggest food producer in Thailand. We do not have a competitor in Thailand. At this moment, our animal feed production is the biggest in the world, so our goal is to be able to compete in the global food market.

1.2 Could you also please give me some brief information with regard to your experience?

My first task in CPF was to improve production processes in the direction of accepting international standards such as ISO standards. Since 1996, we are in accordance with ISO 9001 and in 1998 with ISO 14001. In accordance with ISO 14001, we've learned how to analyze and assess risks of significant aspects in order to find ways to reduce impacts on the environment. We also realized that without certification by international standards we could not reach our ultimate goal – to become kitchen of the world. After we were certified by ISO and other standards (such as HACCP), we started to take a look at environmental issues. Although ISO 14001 provides us an effective management system, it still lacks continuous development. So we searched for an on-going development approach. At the same time, there was a project – Environmental Management Accounting (EMA) – by ASEP, funded by the German government. I attended seminars and training courses and discovered another tool to continuously improve our environmental management and effectively assist our CEOs in making correct decisions on environmental investment projects. We also benefit from collecting information with regard to material and energy flow. Nowadays, the world is interested in climate change and global warming, so we can use this information to assess these environmental aspects as well. Lately, there is a project from EU, which supports us to join the carbon footprint project as a pilot company. And again we can use the same database that derived from the material and energy flow. After that Thailand also initiated a carbon footprint project, and CPF again attended this project with support from TGO. To conclude, I've engaged in quality control and environmental issues for more than 10 years.

Business motivation

1.3 What is the role of water in the food and beverage sector, and how important is it?
Water is needed in all production processes.

1.4 I would like to ask you about risk assessment concerning water resources. Let's begin with the physical risk of water. Did your company ever face water shortage situation due to drought?
In Thailand we do not really have or face severe water shortages or scarcities. Only in dry seasons we do have too little water, and we solve it by preparing for dry seasons in the wet seasons. CPF has its own water management. For our farming, we built ponds in order to preserve rainwater to use in dry seasons. We do not have a problem with regard to water scarcity. We had to buy water sometimes but it was insignificant.

1.5 How about the quality of water? High quality freshwater is essential to maintain the quality and safety of food products. Did you have any problems regarding this subject? For example, do you need to invest in a pre-treatment system because of contaminated water supplies?
We treat water from all sources because we have to be sure that water quality is high before using it in our production processes. It is about food safety. Our water treatment system is a giant one.

1.6 Could you please address the degree of influence of retailers, both domestic and abroad, on your business?
Retailers aboard can have an influence on our operation, but Thai retailers have no such pressure. Our retailers include 7-Eleven and Fresh Market.

1.7 Your company exports some products to foreign countries. If big retailers like Tesco, Carrefour or Wal-Mart request water footprint labeled products, what will be your company's reaction?
If there was a demand from them, we would react by conducting water footprint assessment.

1.8 Because your company is a public limited company, it needs a high degree of trust from investors. Do you think negative public perception about how your company uses water and releases wastewater could lower investor confidence?
Thai investors are interested in transparency of information disclosure, social corporate responsibility and profit. The most important is our company's profit. They are also interested in financial risks.

1.9 Do you think increasing water prices from the government will put pressure on your water management or not? And could it be a driving factor to implement the water footprint method in order to find a hot spot of water usage?
CPF normally looks at social benefits before our business costs. Moreover, the cost of water is low, so even if it increased in the future, we would not be greatly affected by it. However, if society felt that they faced a water scarcity and we used too much water, we would respond differently.

1.10 Water shortages translate into higher energy prices, higher insurance and credit costs. All of these undermine business profitability. What is your opinion on these matters? Should the water issue be considered in business risk assessment?
As of this moment, we have never faced a severe water scarcity, so when we conduct risk assessment, we never look at water.

1.11 To what extent could water use damage your company's reputation? For example, public perception of the amount of water used by Coca-Cola in some countries, and the impact of the Spanish strawberry industry on that country's hydrology, have taken on the dimensions of public campaigns. Seemingly local incidents can translate into serious global brand damage as a result of press attention, which will be exacerbated by the speed of Internet communication.
Water scarcity is still an ambiguous picture for Thailand. Instead, it is a question about how we manage our water resources through water preservation, water recycling and so on. I think we will begin to consider water issues only if communities worry about it.

1.12 Is your company aware of the ecological impacts on water resources that are generated by your operation along the supply chain?
Although we do not consider water in our risk assessment, we always treat wastewater before releasing it into the environment, and we also use recycled water in gardening but not in our production processes. We have never faced the situation like the Aral Sea where neighborhood lakes, rivers and seas are totally polluted.

1.13 As a moral consequence businesses should take a responsibility for their ecological impacts on water resources through eco-friendly production processes. Do you agree with that, and to what extent will your company take a responsibility?
We take care of eutrophication issues for the long term. For example, our shrimp farms are closed-loop systems. We treat water before use and also treat wastewater and reuse it in our farming process. Three advantages of this system are disease control for shrimp farms, friendliness for the environment and reduction of production costs.

1.14 Do you think products with water footprint labeling could be an opportunity for innovation in the food and beverage sector?
Definitely yes. If we want to be kitchen of the world, we have to follow the global trend, not just the Thai trend. If the global trend requested water footprint labeling, we would respond to it by assessing our products' water footprint. If we want to be a leader, then we have to do it before others. However, we will wait until there is an obvious picture about the water footprint issue in order to best understand how to correctly assess it.

Current eco-labeled products by CPF

1.15 Your company already launched carbon labeled products, e.g. chicken meat and chicken teriyaki. May I ask what is your motivation for these?
Our Carbon labeled products include chicken Teriyaki, chicken meat and snacks for dogs. About 10 products, such as chicken Bar-B-Q and chicken Noriyaki, are waiting for certification of the Carbon label this month. We will release them through our own retailer, which is 7-Eleven, in order to promote the fact that we sell Carbon labeled products. We try to develop a clear picture of Carbon labeling through cooperation between CPF and CP all (7-Eleven). Carbon footprinting is also in our CSR strategy. We would like to take care of our environment and at the same time persuade our consumers to pursue our goal by purchasing our carbon labeled products as a way to reduce global warming problems.

1.16 How great have been the benefits in terms of promoting carbon labeled chicken meat as premium products? Is it more expensive than normal chicken meat? Have there been some real advantages there for your company?
It is about our brand image in the direction of environmental aspects. Actually, we conduct a lot of projects concerning environmental issues but many people, at least end consumers, do not know about these and we did not promote this side of our company. Although, we are in accordance with ISO 14001, end consumers do not know or maybe do not understand that it relates to environmental concerns. So, the Carbon label project creates slight awareness in some groups of stakeholders such as researchers. We gain an environmental activist image and perception as a carbon expert. As a result, I get a lot of requests to give other companies, universities or governmental organizations a presentation with regard to our carbon footprint assessment.

Moreover, we want to be a leader of the market. That's why we keep on going with this project. In the long run, it is sustainable for a carbon labeled product itself. At this moment, few people know what a carbon label means, however, it will be more popular in the future. We do not expect any profit from this product range. That's why we sell it at the same price as other products.

Carbon footprint assessment helps us to identify the hot spots in production processes of where it is best to reduce our carbon footprint. As a result, in the future we can reduce our production costs. It leads to a reasonable price of environmentally friendly products.

1.17 Where does the main demand for carbon labeling come from? Could you please tell me about your success story of carbon labeled products?
It began with environmental concerns, which by chance matched with demand from EU. Consumers in EU are already interested in Carbon labeling, and retailers, such as Tesco, have more or less a kind of Carbon footprint campaign and request carbon footprint products from their suppliers. Wal-Mart also requests Carbon footprint information. To conclude, demand comes from our primary customers--retailers in EU, and secondary customers--end consumers in EU. Wal-Mart also requests for Carbon footprint information.

1.18 What is your strategy for launching carbon labeled chicken meat? What is the consumer reaction to the carbon labeled products? Do they understand the meaning of the carbon label? Has the market changed because of carbon labeling?

At the beginning, the image of Carbon labeling was not clear. Only small groups knew what a Carbon label is. As you said that you found our Carbon labeled products in newspapers, it was our strategy to inform end consumers and promote those products. However, now TGO has its own budget to promote Carbon labeling. In my opinion, it will be a long time until end consumers understand. We will continue to release our Carbon labeled products in order to make end consumers familiar with the Carbon label. TGO has a plan to launch Carbon labeled products in the textile industry in order to gain more awareness. Only one year is not enough to create awareness among end consumers. I'm sure that it will take a long time until end consumers have enough knowledge about carbon labeling, at least five years are needed. It also takes time to create awareness and perception among our CEOs.

Implementation of water footprint assessments

1.19 Is it possible to calculate water footprints in your products?

Definitely possible and it won't be difficult to do because we already implement assessments of material and energy flow in our system. So, we have basic data about water use and wastewater, but maybe we have to analyze these data more precisely. I assume that it would be easier than calculating the carbon footprint.

1.20 Do you think there is the potential to use less water in some production processes without buying new technology from foreign countries?

We use water intensively in our factories and farming. In factories, it highly relates with food safety standards that require exact amounts of water for processing. For example, cleaning chicken before further processing to chicken meat needs a specific number of liters of water in accordance with food safety standards. For how to use and acquire water, I think our technologies are still usable. However, if we wanted to change our water recycling system, technologies from foreign countries would be required. I don't think that if one wanted to assess their water footprint, one would need to buy new technology for that sake alone.

Launching water footprint labeled products

1.21 Will consumers in Thailand have a demand for eco-label products in general and for water footprint labeled products in particular?

Consumers in Thailand do not have a clear demand for eco-labeled products. Moreover, Thais do not feel that water is scarce, so water footprint labeled products will be difficult to promote in Thailand.

1.22 What will be your business motivations in order to launch PWFL?

If consumers in foreign countries requested it, we would probably launch water footprint labeling in order to fulfill their demand. When water footprinting has a clear standard, we might launch it as our opportunity to create innovation. And also for our image as an environmentally friendly company who cares about water resources, we will conduct water footprint assessments and release water footprint labeled products to the market.

1.23 Are there any labels for food products by CPF that PWFL could complement?
I assume that assessing a carbon footprint should be similar to a water footprint, and I'm quite sure that their raw data are derived from the same database that is created and collected by material and energy flow. So, we could do it with Carbon labeled products or we could apply it with other products. It depends on the market. If Carbon labeled products were popular, we would add water footprint labels to them and sell them as a premium product that concerns not only climate change and global warming but also water scarcity. However, if the Carbon label target group was not interested in water issues, then we would have to launch a water footprint label on another product such as pork.

1.24 Will farmers or other producers really respond to the challenges when labeling or consumer power in some form, actually forces them to change and take account?
In the food production chain, water is more important for primary producers than end consumers. If water was scarce in some regions, we would not have to wait for market forces because primary producers would face the situation by themselves and would react to it before end consumers. However, if product water footprint labeling worked, then end consumers would have a chance to support producers through purchasing products that have less water footprint. For example, rice depends heavily on water resources. If there was not enough water, then we would have to not only find new sources of water but also a new breed of rice which consumes less water. So, we could survive a water scarcity.

1.25 According to carbon labeled products, do you think you have had enough or adequate support from the government in terms of setting standards and systems so far?
As we participated in the Carbon footprint pilot project, we were fully supported by the government in terms of carbon experts, which means we did not pay an expert's fee, but not in terms of technologies that reduce the carbon footprint. The government does not offer us any incentive to conduct carbon footprint assessments. Instead it provides us know-how about carbon footprinting.

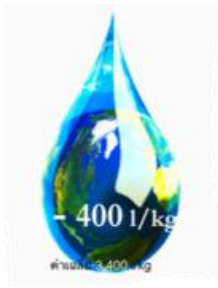
1.26 In order to launch PWFL, participation from stakeholders is needed. Could you please mention some core stakeholders and their role to successfully promote PWFL?
I assume that it would be similar to Carbon labeling, which needs a third party or governmental organization who certifies processes and approves water footprint labels. Businesses should not issue and certify labels by themselves because people normally will not trust the label.

1.27 Do not you think consumers will go for higher level labels like PWFL, or will they go instead for cheaper products?
Quality and price of products are main factors that Thai consumers will consider before they buy a product.

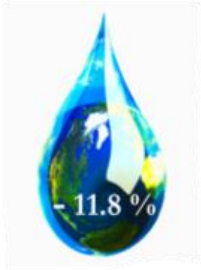
1.28 Regarding the following labels, which one is best suited to use as the water footprint label and why?

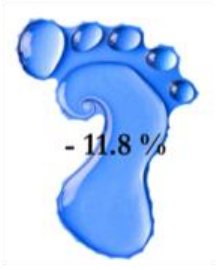
A. 

B. 

C. 

D. 

E. 

F. 

I prefer that the label shows the average amount of water needed as well as the absolute water used because if consumers want to calculate their own water footprint, then they can use directly the amount on the water footprint label. According to Thai culture, I think the world in a water drop is more suitable than the footprint, and it also shows that we care for both the world and water.

Communication method

1.29 Adding a URL on the front of the package and hoping people actually log onto the website when they do their shopping, maybe get their Blackberry out and have a look – I can imagine actually that might make shopping much more exciting for men, but that is probably not going to happen. So while it may not be perfect, do you not accept that having some kind of labeling system, perhaps backed up by these other things, which makes it simple for the consumer at a glance, once they are familiar with it, does have a great benefit in terms of consumer information?
I think only a label is sufficient under one condition: that consumers are already familiar with the label and know the meaning of it. Even if there was no figure on the label, it would work, if consumers were well informed and educated. For example, they know that in order to get a water footprint label the producer has to reduce water use in the production process by 10%. As a result, consumers could make a decision at a glance when they see a label. So, number figures might not necessarily be displayed on the label. However, some consumers might want to know exact figures. For this group, we can add a URL on the packaging and they will find an answer by themselves.

1.30 Labeling is obviously one way of presenting information to the consumer, but there are obviously some issues with that in terms of confusion. Are there any other options besides labeling for achieving that information interaction between the consumer and the farming community to come a bit closer together rather than having a great divide?
If there are a lot of labels on a product, it means, for me, that end consumers of the market accept those labels. As a result, producers try to get as many accepted labels on

their products as possible. It seems to me that labeling is the most practical approach to communicate with end consumers.

1.31 Do you think publishing a sustainable report, which includes the water footprint of a product, is a suitable tool to communicate with end consumers?
We have to look at all interested parties. Some groups may be suitable for a sustainable report and other groups are appropriate for labels. A sustainable report is suited for shareholders, investors and trade partners. It is a kind of business-to-business. End consumers basically do not pay attention to a report. So, we have to serve our stakeholders what they want. We use the same source of information in order to publish a report and launch a label but not exactly the same information is used.

End effect of the water footprint label

1.32 Do you think there is a potential for labeling to actually change attitudes of consumers to be more concerned about the environment?
I think a label on a product can give consumers useful information about the product and its relation to the environment. Moreover, labeling is longer lasting than a campaign, if consumers are aware of the label.

1.33 Do you believe that labeling is the best way of informing people about impacts of their everyday lifestyles?
For a water footprint label, it is not clear to me that it will go that far. However, the method and format of the water footprint label can make consumers aware of their impacts on the environment, or at least they can imagine what it is about.

1.34 In your opinion, can PWFL force food and beverage producers to use less water than usual, which then leads to the end effect that water resources are used more sustainably?
If it is the same method as a carbon label, I think it is possible. I still don't have a clear picture of a water footprint label, but I think it will perform in the same way as earlier launched labels, such as Green labels and No. 5 Energy saving labels. Labeling is a method to create consumer awareness on one issue. If the process to get the water footprint label requires producers to reduce their water footprints, which means reduction in water consumption in production processes, it will force producers to take a look at their water management and find a way to reduce water use in order to be able to compete in the market. If I understand it correctly, water footprint assessment covers all the life cycle of a product, so it will put pressure on all players in the product supply chain. If retailers were interested in water footprinting, producers would have no other choice except to implement water footprint assessments in their chains. As a result, water use in every chain would be reduced as much as possible in order to get the water footprint label. But this is still only my prediction.

- End of the interview -

3.2 Thailand Greenhouse Gas Management Org.: Dr. Pongvipa Lohsomboon

Position: Director of Carbon Business Office
Website: http://www.tgo.or.th/english/
Date: 14th March 2011
Place: Telephone-interview

Basic information about the company and the interviewee

2.1 Could you please provide me some basic information about your organization?
Thailand Greenhouse Gas Management Organization (TGO) is a public and non-profit organization, which is 100% funded by the Thailand government. It is a newly established, about two years old, autonomous governmental organization with a specific purpose as an implementing agency on greenhouse gas (GHG) emission reduction in Thailand. In other words, TGO is the delegation of Thailand in promoting: low carbon activities; investment and marketing on GHG emission reductions; establishing a GHG information centre; reviewing CDM projects for approval; providing capacity development and outreach for CDM stakeholders and promoting low carbon activities; and particularly performing its role as the Designated National Authority for CDM (DNA-CDM) office in Thailand. In 2008, TGO and MTEC decided to work together in order to launch the carbon footprint labeling project in Thailand.

2.2 Could you please give me also some brief information with regard to your experience?
TGO has launched the Carbon label project in Thailand since 2009. We have developed the National Guideline on Product Carbon Footprinting by gathering Life-Cycle-Assessment experts and then recruiting volunteer pilot factories for this project. Twenty-four pilot factories with 24 products joined our project. After that, experts studied each product's life cycle and finally came out with a carbon footprint of each pilot product.

Current situation of carbon labeling in Thailand

2.3 Could you please give me a picture of the current situation in Thailand? Are businesses aware of environmental issues, such as global warming and greenhouse gas?
Theses issues are very popular in Thailand. One hundred seventy-six products are already certified by TGO and have a Carbon label attached to them. Many businesses are interested in Carbon labels. Moreover, I would like to draw a clear picture about Carbon labeling. TGO classifies Carbon labels into three categories, which are the carbon footprint label, the carbon reduction label and CoolMode (used for the textile industry). In

comparison to the water footprint label, I think the first one, the carbon footprint label, is suitable, so after this we will talk about cases of a carbon footprint label which will be called the Carbon label.

2.4 How many companies already use carbon labels for their products or service? And how many of them come from the food and beverage sector?
One hundred seventy-six Carbon labeled products belong to 50 companies. Most of those companies are businesses in the food and beverage sector. Certified products are, among others, rice, chicken meat from CPF, animal food, and packaging for snacks and beverages.

2.5 What are their motivations to have carbon labels on their products or service?
They voluntarily join the Carbon label project. There is no obligation from the government that forces them to join. It is word-of-mouth recommendation. In my opinion, they want to increase their competitive potential in the market. We already conducted a survey about their motivation, and we found that there are at least four main reasons.

First, there is no demand or request from anyone. Companies thought that calculating a carbon footprint is a kind of competitive opportunity. If they send this information to their suppliers, they might consider it as a kind of value added which shows that companies have social responsibility. Second, suppliers from foreign countries requested carbon footprint information. There was a case of one chewing gum producer from USA, which imports synthetic sweeteners from Thailand. Thai exporters did not have any option. If they did not respond to the request, they would lose out as the supplier. Third, they do calculate their carbon footprint because they are afraid that their competitors will do it before them, which leads to competitive disadvantages. Fourth, they just want to be certified and get a label on their products in order to show that they have social responsibility, but this reason is minor when compared with the other three reasons.

2.6 Regarding carbon labeled products, do you think you have had enough or at least adequate support from the government in terms of setting standards and systems so far? What are the political approaches and schemes of the government in order to support the carbon label initiative?
TGO is a governmental organization, 100% funded by the government, so we are fully supported by the government. Moreover, MTEC who works together in the Carbon label project is also 100% funded by the government as well. We can conclude that the Thailand government totally supports the project. There are also other governmental organizations that support us in terms of giving information or training companies. To summarize, the government has a policy to support the carbon footprint project.

2.7 Do you think that this approach or these instruments are also applicable to support Product Water Footprint Labeling initiatives as well?
I am not sure because the carbon footprint project was initiated by cooperation between MTEC and TGO, and we take full responsibility for the whole project. Moreover, we believe that our industries will benefit from this project in the future. However, in the case of water footprinting, water organizations in Thailand might not have any policy regarding a water footprint concept. In addition, water footprinting needs knowledge of the Life-Cycle-Assessment, which is unknown or not easy to understand for those organizations. Another reason is that Thailand is a land of water. We have both floods and droughts

every year, but actually we have never faced any severe water scarcity. As a result, other water management approaches might be more important than launching water footprint labeling. Most people in Thailand might think that water footprint labeling is not necessary or at least less important. Finally, in order to launch a label and make it popular, a high financial budget, knowledge and a lot of experts are needed. For budget and knowledge, we can slowly collect them, but for water footprint experts in Thailand, those we do not have at this very moment. So, for launching the water footprint label in Thailand, we have to begin from the infant stage, like where carbon footprinting was two years ago.

2.8 In order to launch carbon labeling, participation from stakeholders is needed. Could you please mention some core stakeholders and their role?
In addition to TGO and MTEC, we also invited researchers from many universities to join our project as LCA technical experts. They worked together with all pilot factories. We also gained necessary information, such as emission factors, from the National Life-Cycle-Inventory (LCI) database gathered by MTEC. There are also other support organizations that provide training courses and conduct seminars for pilot factories. And the most important factor for our success story is the industry sector that is interested in our project.

2.9 Do you think the number of businesses that need carbon labels will increase in the future? Why?
The Carbon label trend in Thailand will definitely increase in the next two years.

Marketing strategy of Water Footprint labeling

2.10 The fact is that there is no water footprint label on the market, but I would like to initiate it in the food and beverage sector in Thailand. The carbon label is similar to the water footprint label, and you are an expert in marketing the carbon label. So, maybe you can give me some ideas with regard to your experience in marketing strategy of the carbon label in Thailand that could be used for launching the water footprint label in the future. What are the main factors in launching the water footprint label on a product?
Need or demand is the main factor to launch the water footprint label. However, it is not necessary that demand for the label must come from end consumers. It might come from foreign countries who might request the water footprint, as in the case of the carbon footprint. Nowadays, unexpectedly, there are some Thais asking us, what is the water footprint. Because there is no explicit case about a water footprint and methods to calculate it, it is still not yet released. At this moment, ISO tries to push a standard for a water footprint (ISO 1406) but still only has a working draft. Moreover, the way to calculate water is more difficult than energy because there are many sources of water that are used in a company. We also do not have any water footprint experts in Thailand, and there is still no request from foreign countries.

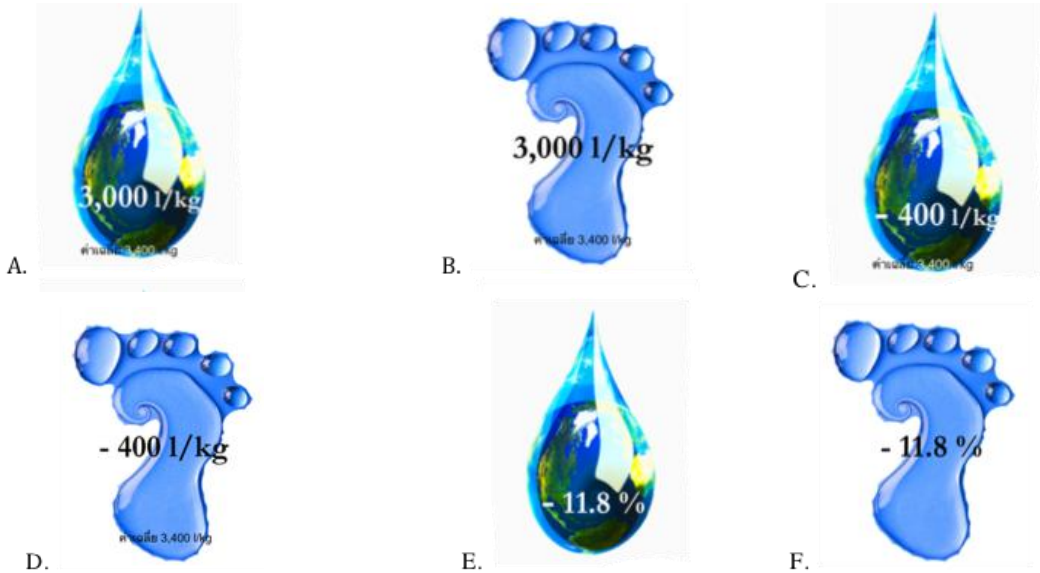
2.11 In order to buy an eco-friendly product like water footprint labeled products, some degree of educational background is needed. What did you do at the beginning to create awareness of the carbon label?
I agree that basic educational background is important, but how to transfer information to end consumers is also an issue. It requires a lot of factors such as effective public rela-

tions and a financial budget especially for advertisement. Thais love advertisement. We have arranged carbon footprint campaigns for consumers. However, consumer awareness of carbon footprint is still low. To be honest, the real factor that made carbon footprint projects so popular is the need from businesses, not from consumers. For the case of water footprints, I think it will be the same as for carbon footprints. It is very difficult to create green products in general and water footprint labeled products in particular, through demand from Thai consumers. Two general reasons are low awareness and budget constraints.

2.12 I would like to ask about the price of carbon labeled products. Basically, organic and eco-friendly products are perceived as premium products, and consumers are willing to pay more for their value-added characteristic. Moreover, there are also extra costs such as investing in new technology and costs of labeling (e.g. internal audits, label fees, expert fees, etc.). It is understandable that consumers are willing to pay more for organic products because they are good not only for consumer health but also for the environment. However, the carbon labeled products, which is a kind of eco-label, are good for the environment, but consumers do not directly benefit from the extra characteristic as they do from organic products. Do you think it is possible to sell labeled products with the same price as conventional products? If not, what is the suitable and effective marketing strategy to sell them?

All Carbon labeled products are sold at the same price as conventional products because companies know that the Thai market is not ready for such products and they do not aim to make any profit from these products but rather to gain competitive advantage in global markets or to show that they have CSR. However, other environmentally friendly products are a bit more expensive than conventional products, such as some clothes or high quality imported recycled paper.

2.13 Regarding the following labels, which one is best suitable to use as the water footprint label and why?



In my opinion, neither form can communicate the meaning of a water footprint to end consumers in Thailand. Moreover, a footprint icon is absolutely not suitable for the Thai culture. We do not use any footprint icon on the carbon footprint label as well. If a water drop with the earth will be used, we might need to promote it with advertisements in order to relate it with the water footprint concept. I, personally, would not choose either of

them; however, I found that the water drop is better than the footprint. To conclude, I prefer choice A because it is, for me, easier to understand.

Communication method

2.14 Adding a URL on the front of the package and hoping people actually log onto the website when they do their shopping, maybe get their Blackberry out and have a look – I can imagine actually that might make shopping much more exciting for men, but that is probably not going to happen. So while it may not be perfect, do you not accept that having some kind of labeling system, perhaps backed up by these other things, which makes it simple for the consumer at a glance, once they are familiar with it, does have a great benefit in terms of consumer information?
I agree that using a label is better than adding a URL on a product, if there are proper public relation campaigns and consumers are well educated about the label.

2.15 Labeling is obviously one way of presenting information to the consumer, but there are obviously some issues with that in terms of confusion. Are there any other options besides labeling for achieving that information interaction between the consumer and the farming community to come a bit closer together rather than having a great divide?
According to my experience as a label practitioner, I find that labeling is still an effective tool to communicate with end consumers. Nevertheless, an effective label should clearly communicate its objective and should also have a brief explanation on the product packaging, which provides consumers a chance to read before they make their purchase decision. Adding a URL on a product might be effective in Europe but not in Thailand because we are not familiar to find information by ourselves. Another possible method might be to invest in advertisements on television and provide information about the value added of the product, but it will be costly.

2.16 Do you think publishing a sustainable report, which includes the water footprint of a product, is a suitable tool to communicate with end consumers?
I think researchers, investors or institutions will read those reports but not end consumers. Labels should be used to communicate with end consumers and reports should be used to communicate with other stakeholders.

End effect of the water footprint label

2.17 Do you think there is a potential for labeling to actually change attitudes of consumers to be more concerned about the environment?
Honestly, I am not sure because Thai consumers are difficult to predict. In the case of green labels or other environmentally friendly products, the one who buys is already a green consumer. Whether labels can change a conventional consumer into a green consumer, I have no idea. In the case of No. 5 energy-saving labels (the most energy saving label on electric products in Thailand), consumers can relate environmental issues with their expenses. When they see this label, they know that they can save energy and also money at the same time. It might make them greener although we cannot be sure whether they are actually greener or they just want to save money. I really do not know the answer to this question.

2.18 Do you believe that labeling is the best way of informing people about impacts of their everyday lifestyles?
Labels are not the best way to inform people about their impacts to the environment but rather education, books and websites that provide information about day-to-day impacts or offer carbon calculations for each person. We can use labels to inform about impacts as well, yet they are just not the best way.

2.19 In your opinion, can Product Water Footprint Labeling force food and beverage producers to use less water than usual, which then leads to the end effect that water resources are used in a more sustainable way?
I am not sure. But if there were a water footprint label that producers could have only if they could reduce their water footprint of a product, it would definitely lead to reduction of water use in some degree, though not throughout a whole industry.

- End of the interview -