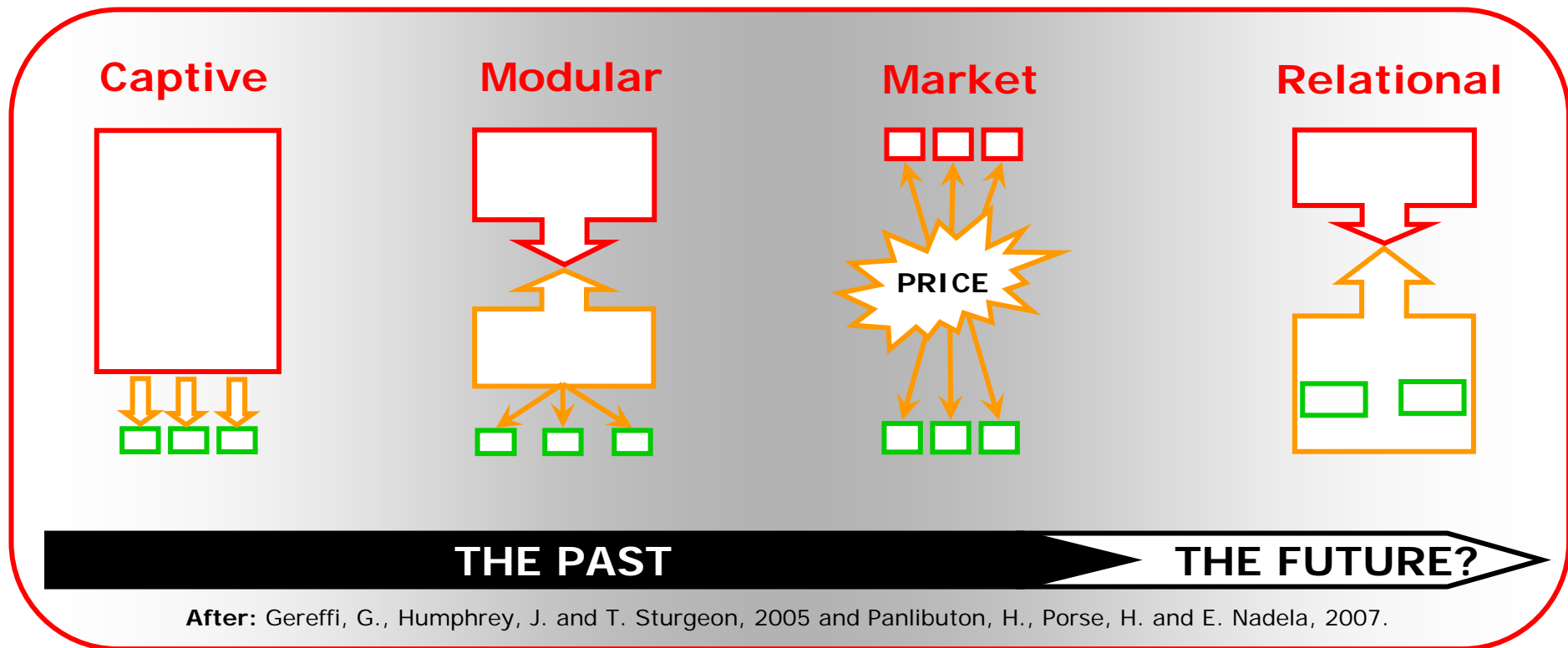


# Structure and Development of Tropical Red Seaweed Value Chains

With focus on the Red Algal Galactan Seaplants (RAGS)



by Iain C. Neish, SEAPlant.net Monograph no. HB2A 1108 V2 VC

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## GLOSSARY

**ADB** - Asian Development Bank

**ARMM** – Autonomous Region of Muslim Mindanao.

**ATC** - Alkali-treated cottonii chips

**AusAID** - Australian Agency for International Development

**BDS** - Business Development Services

**BIMP-EAGA** – Brunei, Indonesia, Malaysia Philippines East ASEAN Growth Area

**Coral Triangle** – includes most of East Malaysia, Philippines, Indonesia, Timor Leste, Papua New Guinea and Solomon Islands

**Cottonii** – Kappaphycus spp.

**Cultivar** – A clone derived from vegetative propagation originating from a single seaplant thallus.

**DKP** - Dinas Kelautan dan Perikanan (Indonesian Department of Oceans and Fisheries)

**EAI** - East ASEAN Initiative of AusAID

**End-user** – an enterprise that utilises as-is or further-processed ingredient building-blocks or ingredient solutions in goods that are purchased by wholesale and retail enterprises.

**Eucheuma** - “spinosum” of the trade; source of iota carrageenan.

**Eucheuma seaplants** – Betaphycus, Kappaphycus and Eucheuma

**FAO** – United Nations Food and Agricultural Organization

**Further processor** – an enterprise that purchases -building blocks for further refinement.

**GMP** - Good Manufacturing Practises

**Governance system** - specifies the mutually agreed terms and conditions that apply to transactions; they specify how any disputes will be settled; and they settle things when disputes happen.

**GTZ** - Deutsche Gesellschaft für Technische Zusammenarbeit (GTZ)

**Hierarchical governance** - based on explicitly defined systems of authority, rank and layered reporting relationships that are typified by the presence of powerful leaders.

**IBB - Ingredient building-blocks** – products derived or extracted purely from one defined source of raw material and then sold to further-processors or solution providers.

**IFC – AS** - International Finance Corporation – Advisory Services

**IFC-PENSA** - IFC Small Business Development in Eastern Indonesia

**IMTA** - Integrated Multi-Trophic aquaculture

**JaSuDa** – Jaringan Sumber Daya (Source Net), a program of SEAPlant.net.

**Kappaphycus** - “cottonii” of the trade; a seaplant source of kappa carrageenan

**KITS** - Knowledge + Information + Tools + Solutions

**Marinalg** – World Association of Seaweed Processors (marinalg.org)

**MSME** - Micro, small or medium enterprise

**RC** - Refined Carrageenan

**SME** - Small to Medium Business Enterprise

**Spinosum** – Eucheuma spp.

**SRC** – semi-refined carrageenan (a.k.a. processed eucheuma seaweed, PES or E407a)

**Strategic business alliances** - result when two or more enterprises combine core values and unique resources in order to seek competitive advantage in specified value networks.

**SPNF**- Seaplant.net Foundation

**SRC** - Semi-refined Carrageenan

**Tactical business alliances** - result when two or more enterprises combine firm resources (including relational capital) in order to optimize process capacity.

**Trust governance** - based on established patterns of personal integrity, trust and commitment between individuals and among groups.

**TNT** – The Nature Conservancy

**Unique resources** - kept totally in-house as “core competencies”. They are the basis for enterprise competitive advantage

**USD** – United States Dollar.



# Structure and Development of Tropical Red Seaweed Value Chains With focus on the Red Algal Galactan Seaplants (RAGS)

by Iain C. Neish, SEAPlant.net Monograph no. HB2A 1108 V2 VC

## PREAMBLE

### The need for understanding value chains

An effective understanding of how value chains function is essential for stakeholders in all businesses. This monograph was written as basic instructional material for seaweed farmers and other stakeholders in tropical seaweed-to-carrageenan value chains. For the most part it also applies to tropical seaweed-to-agar value chains

### The carrageenan seaweed crisis of 2008

During late 2007 and through the summer of 2008 the carrageenan industry was severely effected by unprecedented, rapid rise in cottonii (Kappaphycus spp. ) prices. This was labelled by many as a "seaweed crisis" but tropical carrageenan or agar raw materials other than cottonii were not effected. In fact cultivated spinosum (source of iota carrageenan) and Gracilaria (source of agar) were readily available and attractively priced for processors.

The "cottonii crisis" has been characterized as a supply failure caused by global warming, diseases and other phenomena but the data shown in SEAPlant.net Monograph no. HB2B 0808 V2 and field observations by Seaplant.net do not bear out that theory.

It appears that the cottonii crisis of 2008 was caused by a sudden rise in cottonii demand – mainly from China – and value chain failures caused by defective commercial linkages between farmers and processors. Specifically the failure was related to a predominance of "market governance" value chains in which there was a disconnect between most farmers and most processors and seaweed quality standards reached record lows.

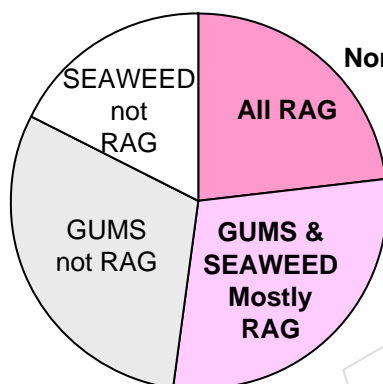
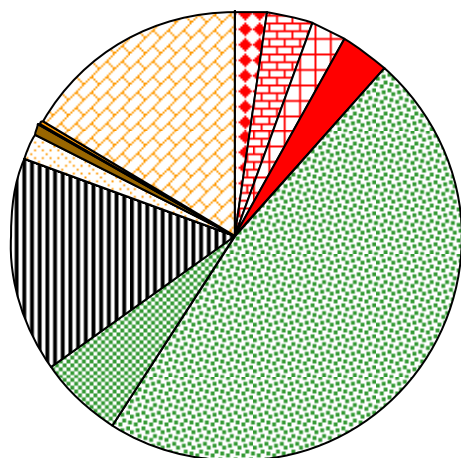
### Preventing future cottonii crises

In this monograph postulated reasons for recent RAGS value chain failures are presented along with trade data. It is proposed that a shift toward "relational governance" value chains can prevent future events such as the cottonii crisis of 2008. This shift can also revive innovation in tropical-seaweed-based value chains; it can increase value added close to seaweed sources; and can broaden the income base of seaweed farmers.

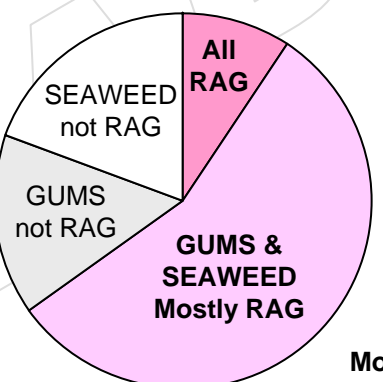
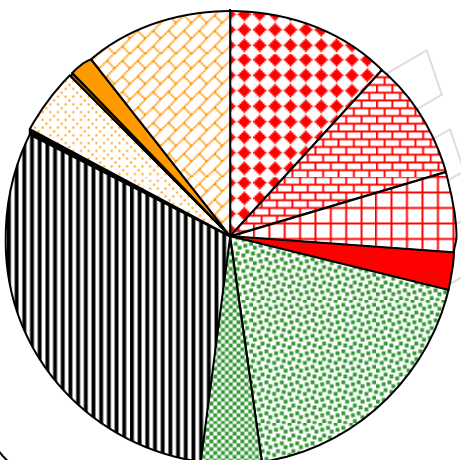


## A-1. Global seaweed and gum imports 2002-2006

### A. VALUE IN K USD CIF



### B. VOLUME IN TONS



	TOTALS	%
All RAG	941,064	23.4
Mostly RAG	1,150,587	28.6
Non-RAG gums	1,231,736	30.6
Non-RAG seaweeds	699,789	17.4
TOTALS	4,023,176	100.0

**RAGS products accounted for about 52 % of total value and 65% of total volume of the global trade among 34 major trading and producing nations**

	TONS	%	K USD	%
agar	36,580	2.2	480,727	11.9
carrageenan	55,573	3.4	350,968	8.7
vegetable gums	39,075	2.4	218,416	5.4
RAG seaweeds	61,309	3.7	109,370	2.7
Undefined seaweeds	771,310	47.0	763,003	19.0
other algae	101,389	6.2	169,168	4.2
Non-RAG gums	256,095	15.6	1,231,736	30.6
Non-RAG seaweeds	1,184	0.1	11,425	0.3
Hizikia	29,625	1.8	185,235	4.6
Laminaria	10,308	0.6	9,088	0.2
Non-RAG algae	4,572	0.3	5,105	0.1
Porphyra	3,395	0.2	59,476	1.5
Undaria	269,548	16.4	429,460	10.7
TOTALS	1,639,965	100.0	4,023,176	100.0

	TOTALS	%
All RAG	153,462	9.4
Mostly RAG	911,773	55.6
Non-RAG gums	256,095	15.6
Non-RAG seaweeds	318,633	19.4
TOTALS	1,639,965	100.0

Data from SEAPlant.net  
Monograph no. HB2B 0808 V2



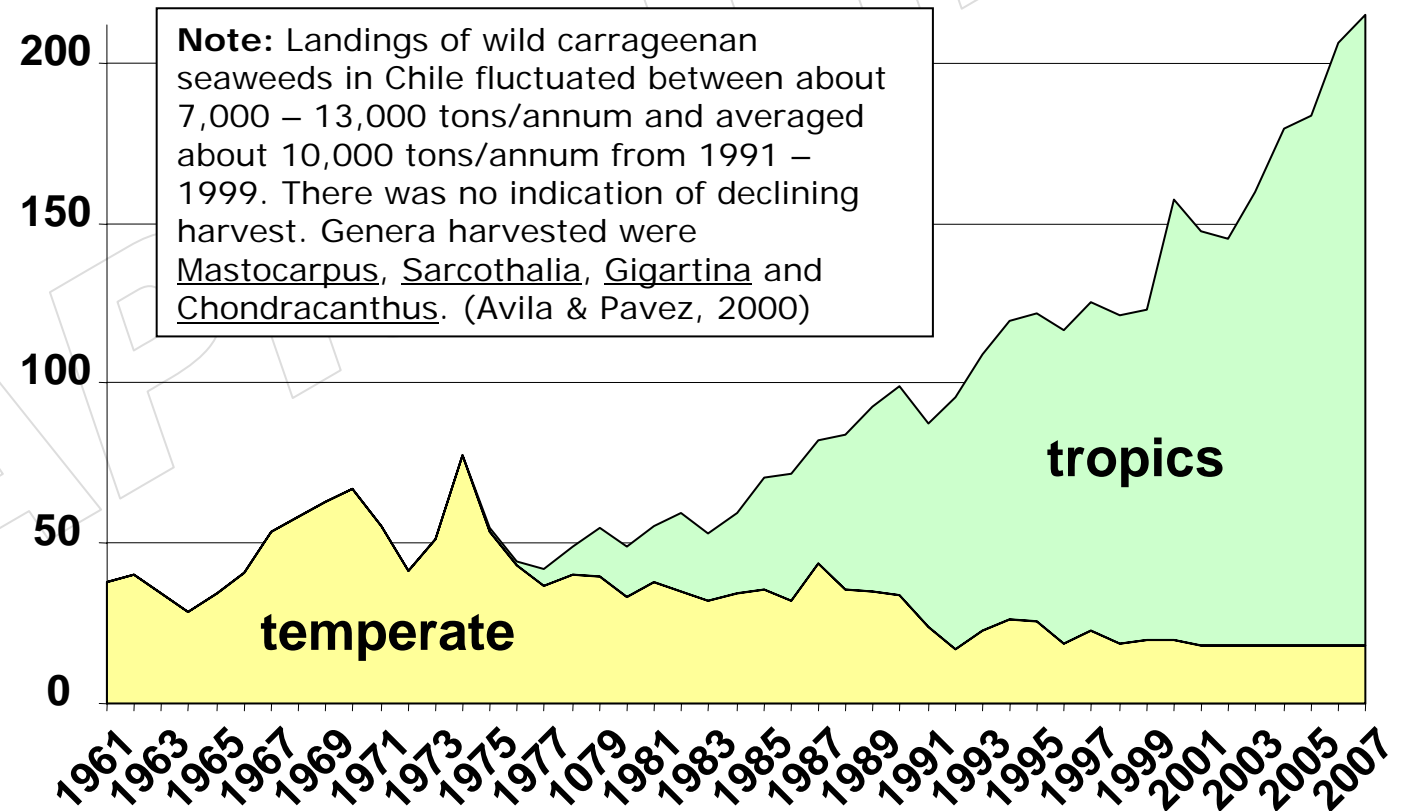
## A-2. cultivated tropical RAGS - dominant carrageenan raw material

This figure presents a graphic history of the production of carrageenan-source seaplants from 1961 to 2007.

**Top (green):** Estimated production of the commercially cultivated “warm water” seaweeds *Kappaphycus* spp. + *Eucheuma* spp. In Malaysia, Indonesia, and the Philippines 1975-2007 (SEAPlant.net data)

**Bottom (yellow):** Estimated production of commercially harvested wild “cold water” red seaweeds (mostly *Chondrus crispus*; some *Furcellaria fastigiata*) from France, Canada, Chile and the U.S.A. 1961-2001. (after FAO and Prince Edward Island Fisheries Dept. statistics).

**Note:** Comprehensive data were not available for all years and all locations but the numbers shown appeared to reflect gross value chain behaviour. The production of *Eucheuma* spp. (“spinosum”) occurred more or less in parallel and production has generally run about 20% of *Kappaphycus* production. For the period 2002-2006 the tropical countries included here accounted for about 85% of the tropical seaweed trade. Tanzania, Peru and Vietnam accounted for most of the balance.





## A-3. Basic **R**ed **A**lgal **G**alactan **S**eaplant (RAGS) value chain products

The foundation structure of RAGS value chains comprises three levels that start with live seaweeds, proceed through a “building block” stage and result in hydrocolloids that are incorporated into “ingredient solutions”. These solutions are utilized in making products for consumer and industrial markets.

### RAW WEED

- **Gracilaria**
- **Spinosum**
- **Cottonii**
- **Sacol**
- poor standardization
- constant quibbles among buyers & sellers over MC and quality factors

### BUILDING BLOCKS

- anything from seaweed to “pure” gum
- transparency, GMP & QC important

transparency adds value...  
I.P. difficult to protect

### SOLUTIONS

- ❖ blends and systems built from building blocks

intellectual  
property is  
a core asset

The tropical RAGS most commonly utilized are from the genera Eucheuma, Kappaphycus (order Gigartinales) and Gracilaria (order Gracilariales). Almost all tropical RAGS are produced on farms as opposed to being harvested from wild stocks. The tropical RAGS most common in commerce comprise four distinct groups:

- Gracilaria is known commercially as gracilaria and is a source of a hydrocolloid known as agar that is generally utilized in products other than those with biomedical applications.
- Eucheuma spp. is known commercially as “spinosum” and is a source of a hydrocolloid known as iota carrageenan.
- Kappaphycus alvarezii is known commercially as “cottonii” and includes several cultivars including those known as tambalang, adik-adik, kapilaran, kab-kab, giant, vanguard, putan and bibit safari. These cultivars are sources of the hydrocolloid known as kappa carrageenan.
- Kappaphycus sp. (designated by some as K. striatum) of the “sacol” and “flower” cultivars is known commercially as “sacol” and is a source of kappa carrageenan that is regarded by some in the industry as being slightly different in behavior than the carrageenan from other Kappaphycus cultivars.

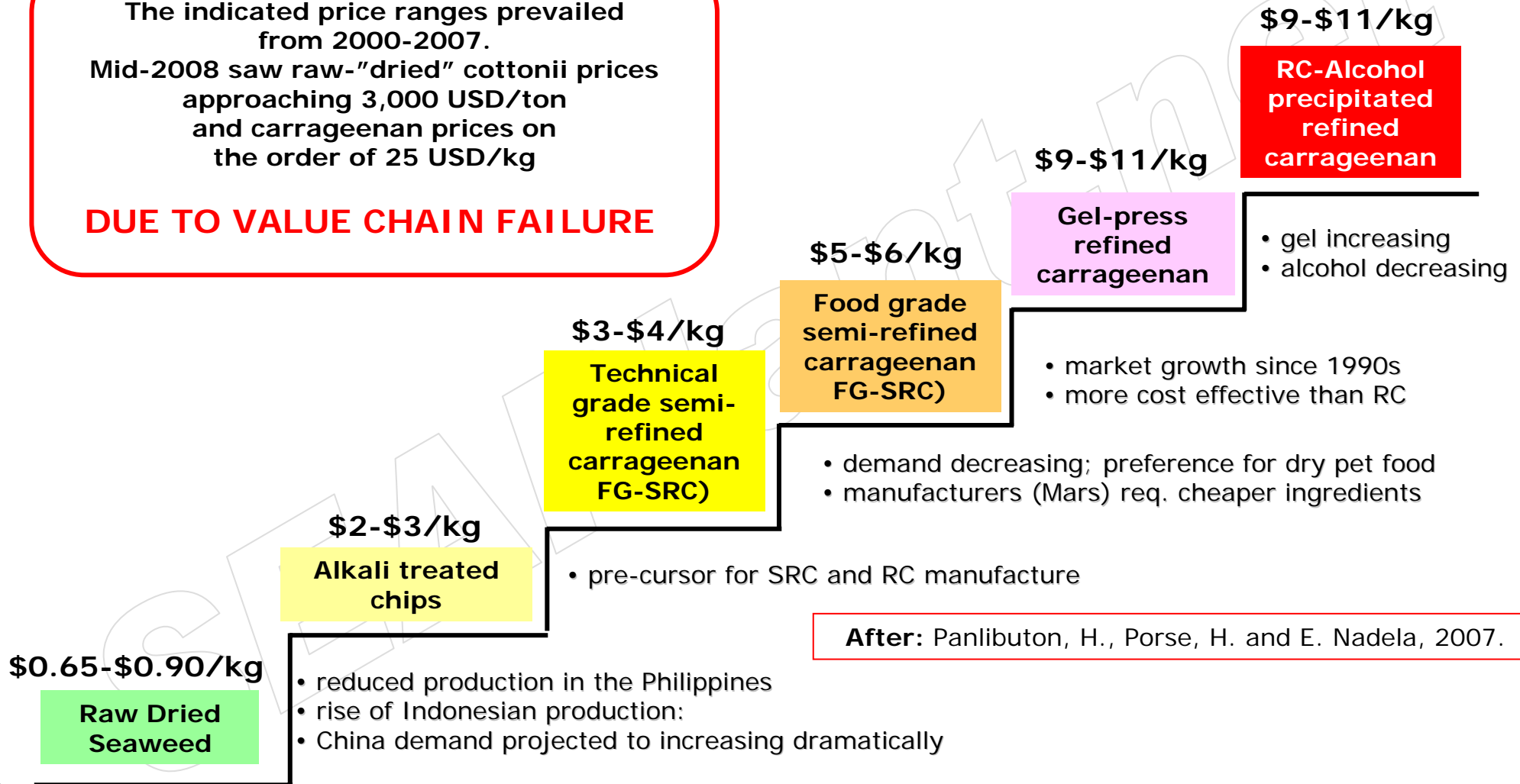


## A-4. Major kappa-carrageenan “ingredient building blocks”

The indicated price ranges prevailed from 2000-2007.

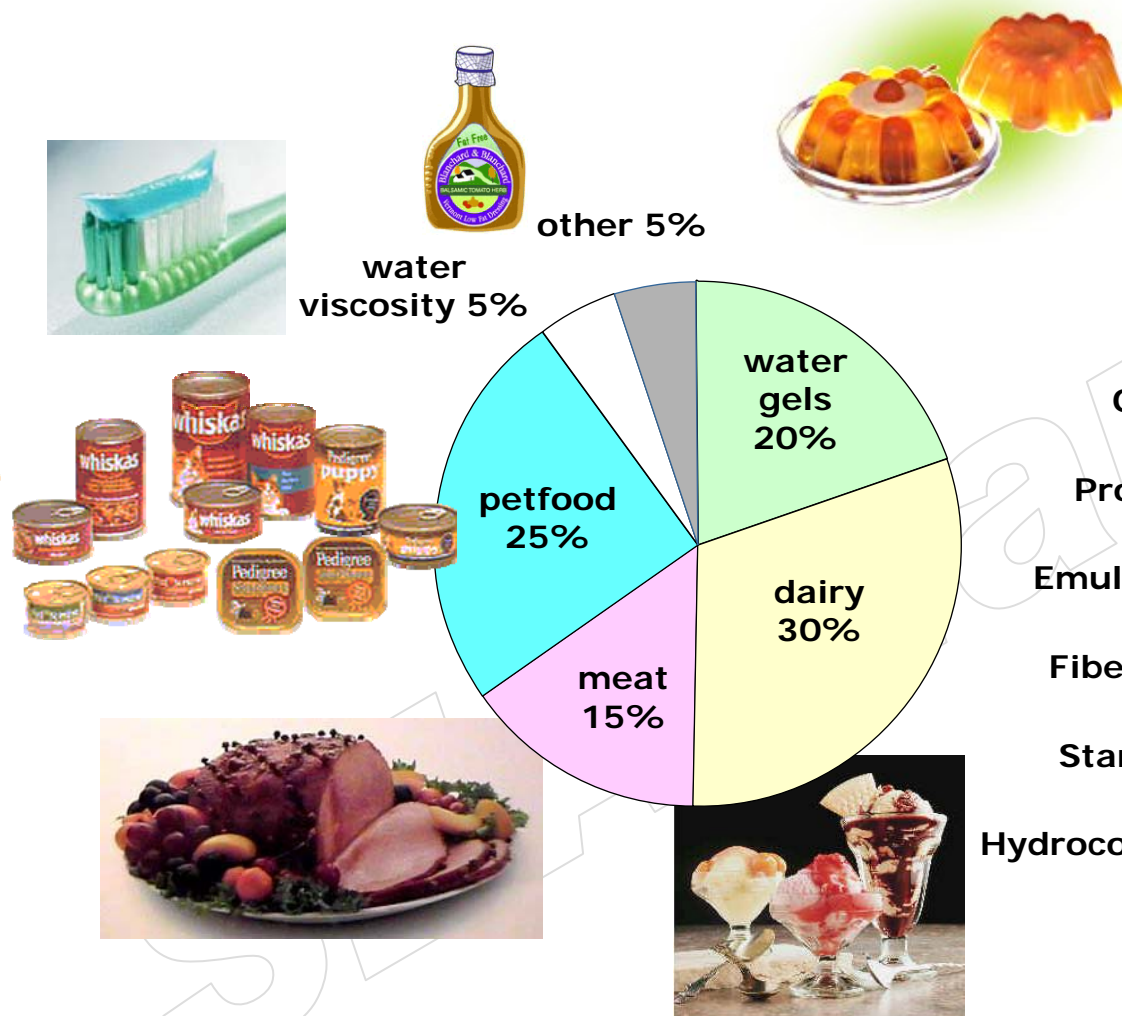
Mid-2008 saw raw-“dried” cottonii prices approaching 3,000 USD/ton and carrageenan prices on the order of 25 USD/kg

**DUE TO VALUE CHAIN FAILURE**



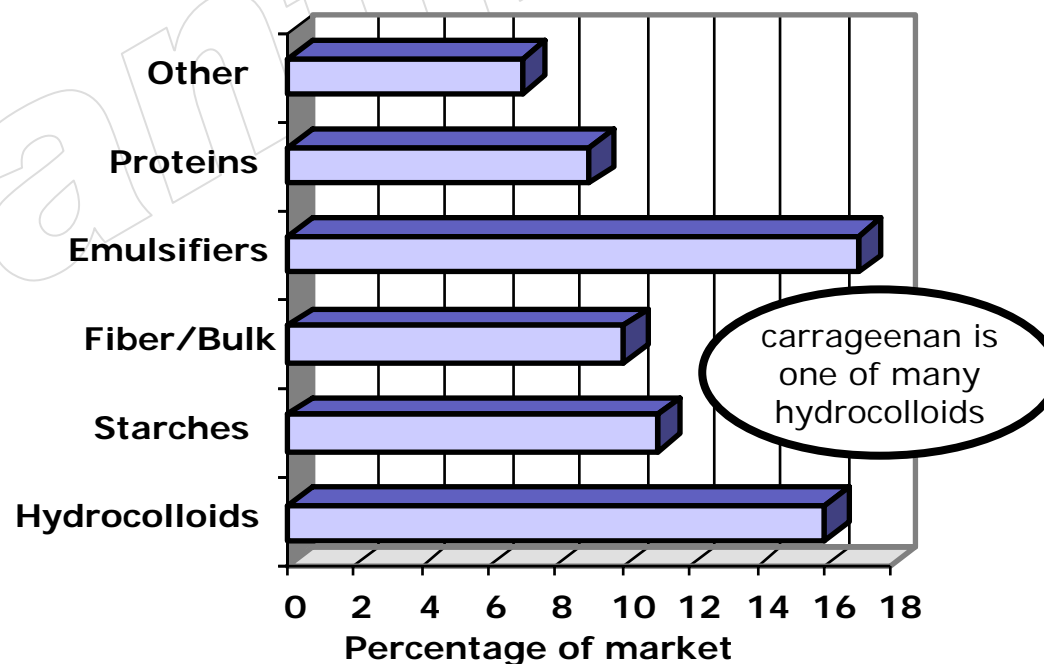


## A-5. World carrageenan applications



Global carrageenan production is about 50,000 metric tons per annum \*

Texturizer and stabilizer products



\* from Panlibuton, H., Porse, H. and E. Nadela, 2007.



## A-6. Global sources of tropical seaweeds and seaweed products (2002-2006)

The  
Coral Triangle  
accounted for  
almost 86% of  
volume and  
85% of value  
of tropical  
seaplant  
production.

Indonesia and  
the Philippines  
dominated.

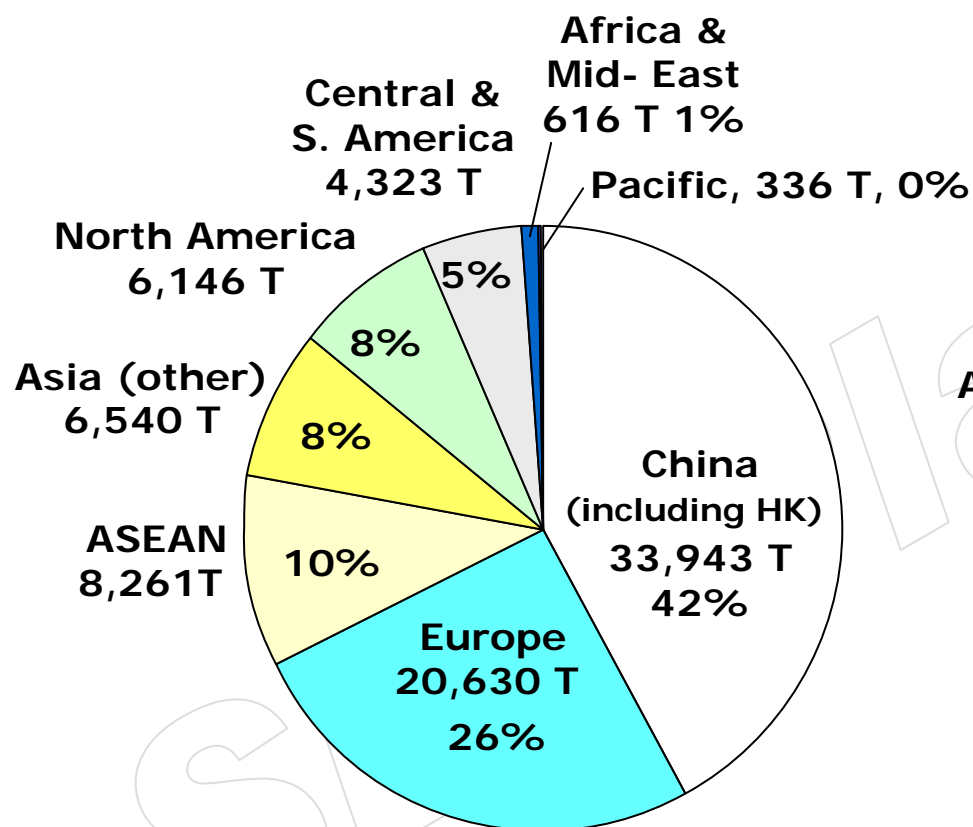
SOURCE	TOTAL TONS	% TONS	SOURCE	K USD CIF	% USD CIF
Indonesia	238,734	49.2	Philippines	251,605	51.2
Philippines	170,564	35.2	Indonesia	151,273	30.8
Tanzania	29,756	6.1	Taiwan	30,091	6.1
Peru	14,278	2.9	Malaysia	14,302	2.9
Vietnam	8,292	1.7	Peru	12,343	2.5
Malaysia	5,369	1.1	Tanzania	11,392	2.3
Thailand	5,191	1.1	Thailand	7,526	1.5
Cambodia	3,451	0.7	Tonga	3,144	0.6
Taiwan	2,553	0.5	Vietnam	3,128	0.6
Madagascar	2,365	0.5	Cambodia	2,165	0.4
Tonga	2,061	0.4	Madagascar	1,454	0.3
Kiribati	576	0.1	Brazil	1,139	0.2
Brazil	532	0.1	Senegal	554	0.1
Solomon Islands	471	0.1	Namibia	479	0.1
Namibia	374	0.1	Solomon Islands	358	0.1
Senegal	161	0.0	Kiribati	346	0.1
Dominican Republic	57	0.0	Cuba	339	0.1
Sri Lanka	44	0.0	Dominican Republic	73	0.0
Cuba	18	0.0	Sri Lanka	67	0.0
	<b>484,850</b>			<b>491,776</b>	

From: SEAPlant.net Monograph no. HB2B 0808 V2.

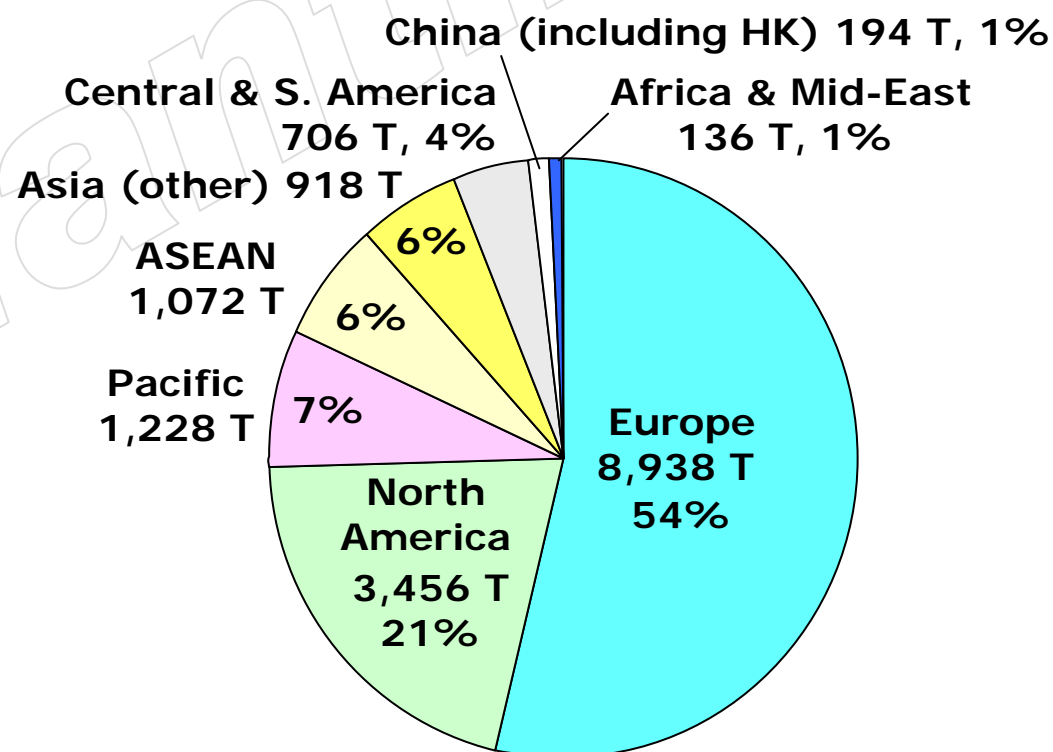


A-7. average annual exports from Indonesia and the Philippines  
metric tons from 2000-2007

**RAG seaweed 80,794 t/yr**



**RAGS gums 16,647 t/yr**



Data: from SEAPlant.net

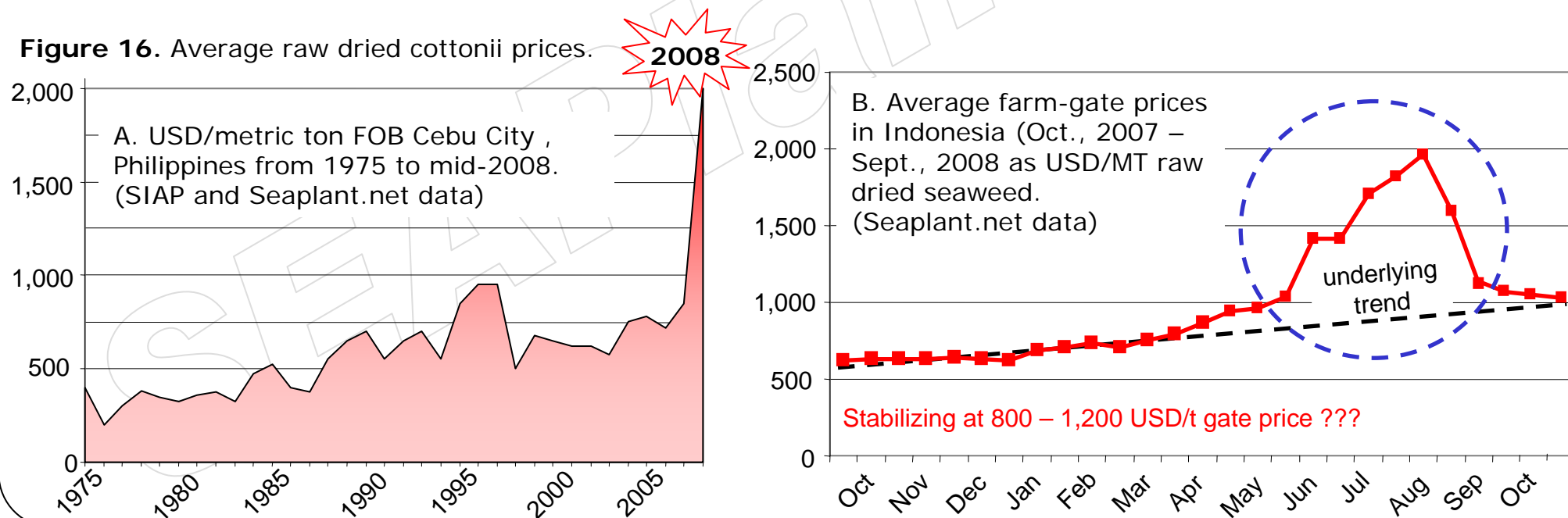


## A-8. the cottonii crisis of 2008

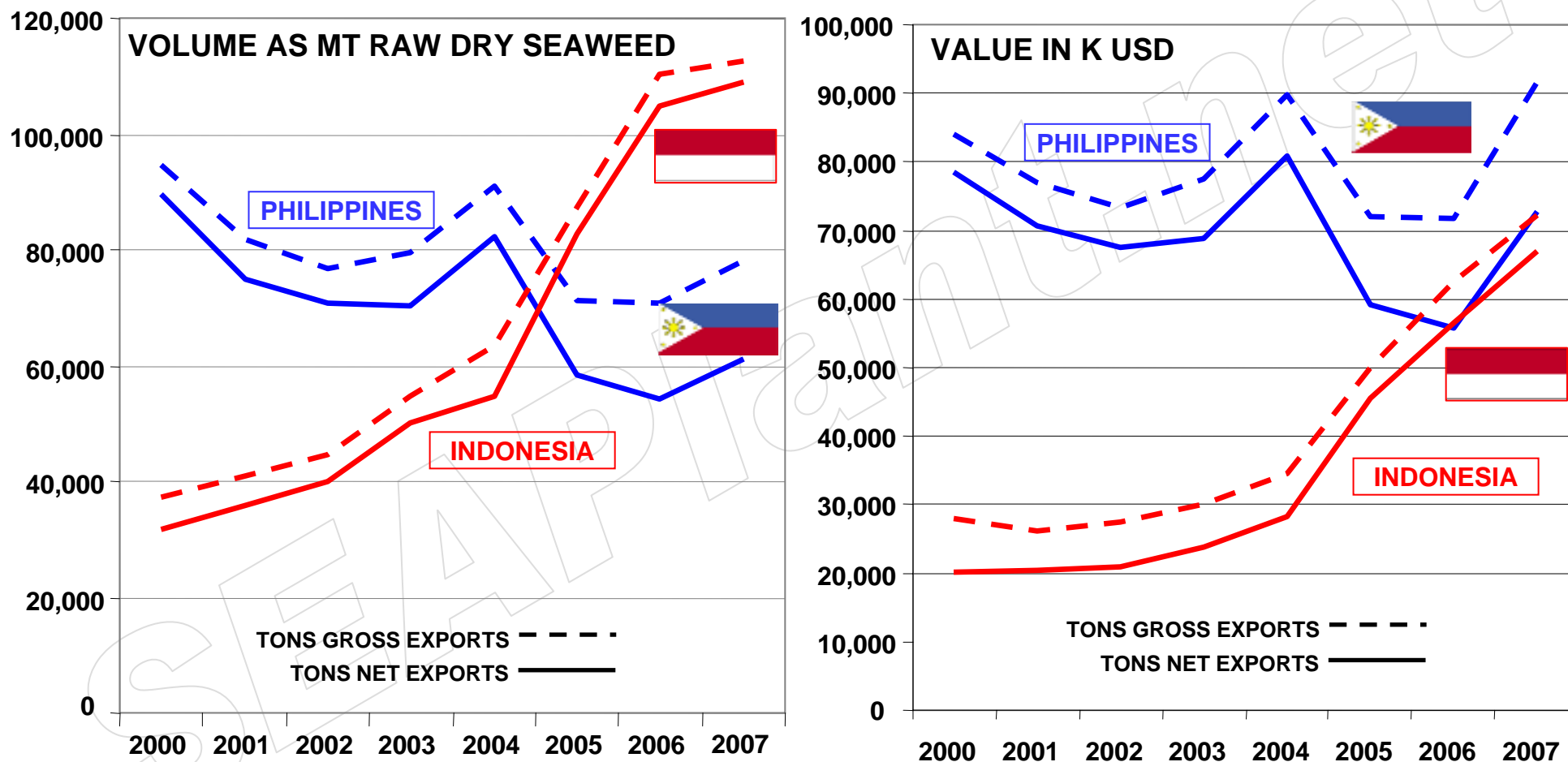
During 2008 spinosum and Gracilaria prices remained stable but global prices for cottonii reached unprecedented levels of as much as USD 3,000/ton (Figure 16 A). Prices peaked around August and by October (the time of writing) farm gate prices in Indonesia appeared to be leveling off at about USD 1,000/ton but and the industry consensus was that this level would probably become the norm for the near future. Factors involved in the 2008 cottonii crisis appeared to include:

- ✓ During 2007 the rate of growth in farm production was below the rate of demand growth by about 6-10,000 tons;
- ✓ Inventories were low at all levels of the value chains;
- ✓ Many processors had poor knowledge of actual crops production levels and patterns;
- ✓ Unusually aggressive buying by some processors set off a period of panic-buying;
- ✓ As prices rose standards were poorly applied so cottonii quality reached generally low levels
- ✓ "Market governance" appeared to operate poorly for cottonii-to-carrageenan value chain links

**Figure 16.** Average raw dried cottonii prices.



## A-9. Indonesia and Philippines gross and net exports (2000-2007)



From: SEAPlant.net Monograph no. HB2B 0808 V2.



## A-10. Overview of Indonesia trade balance in RAGS products

1. Indonesian annual seaweed volume rose from less than 40 K MT/yr to over 100 K MT/yr from 2000-2007.

2. The value of Indonesian trade in RAGS products has increased strongly at an average of 17.8% for total exports and 25.8% for net exports from 2000-2006.

3. Growth was strongest in the raw seaweed segment but less-refined and fully-refined segments also showed growth.

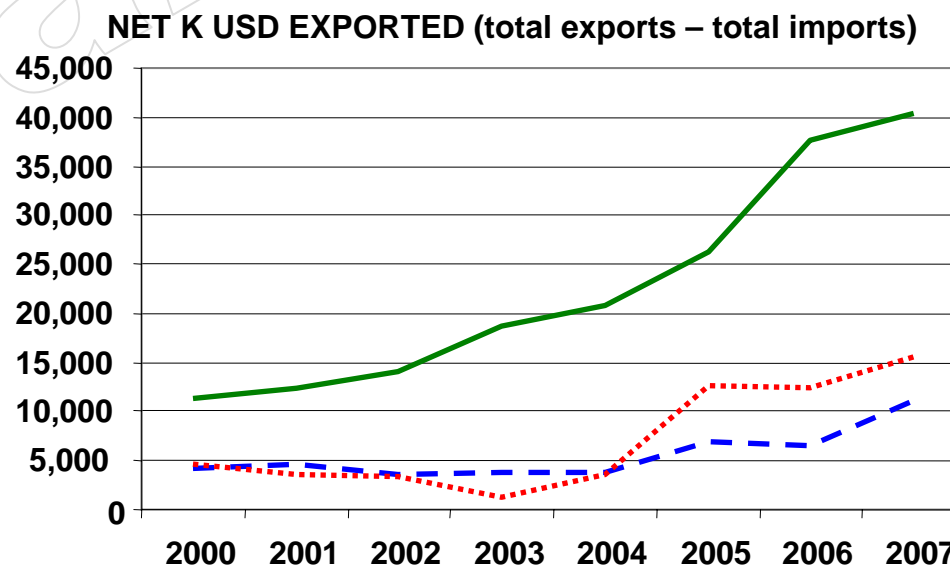
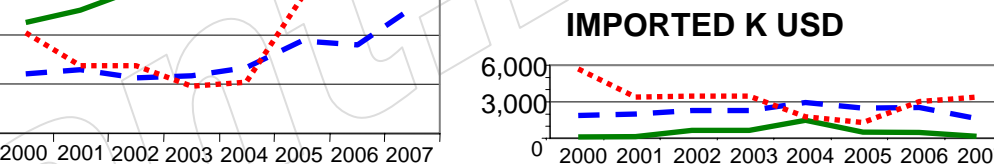
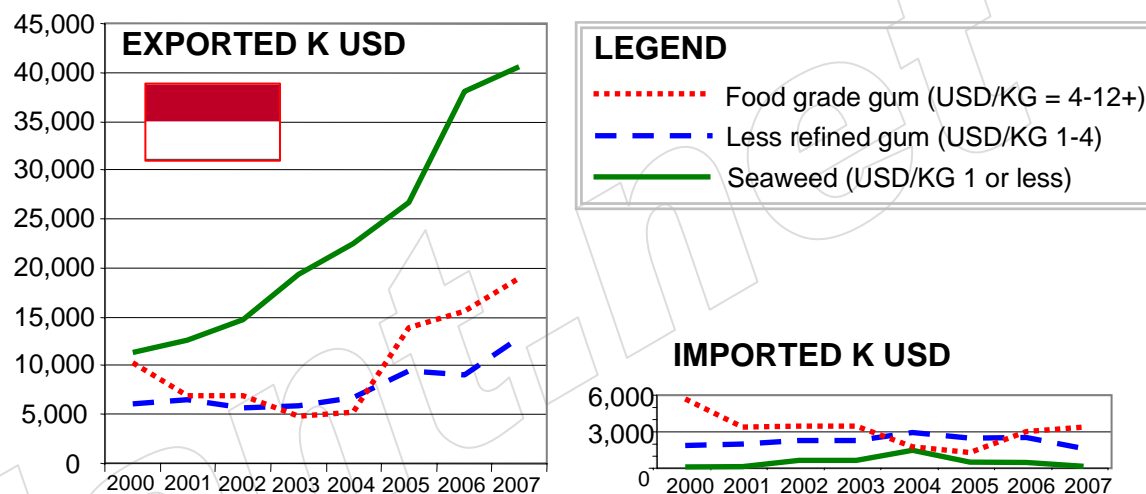
4. If all figures were combined China + Hong Kong accounted for almost half of tonnage and value for Indonesian RAGS exports.

5. Other RAGS sales were distributed among dozens of other jurisdictions.

6. Most Indonesian exports were raw dried seaweed rather than value-added gums.

7. Indonesian exports tended to be lowest during the first quarter of each year and highest during the third or fourth quarter.

8. Based on product values it appeared that many of the exports shown as "gums" were actually raw seaweed (e.g. *Gracilaria* declared as agar).



From SEAPlant.net Monograph no. HB2B 0808 V2





## A-11. Overview of Philippines trade balance in RAGS products

1. The value of the Philippines' trade in RAGS products declined at an average of about 2.1% for total exports and 4.1% for net exports from 2000-2006.

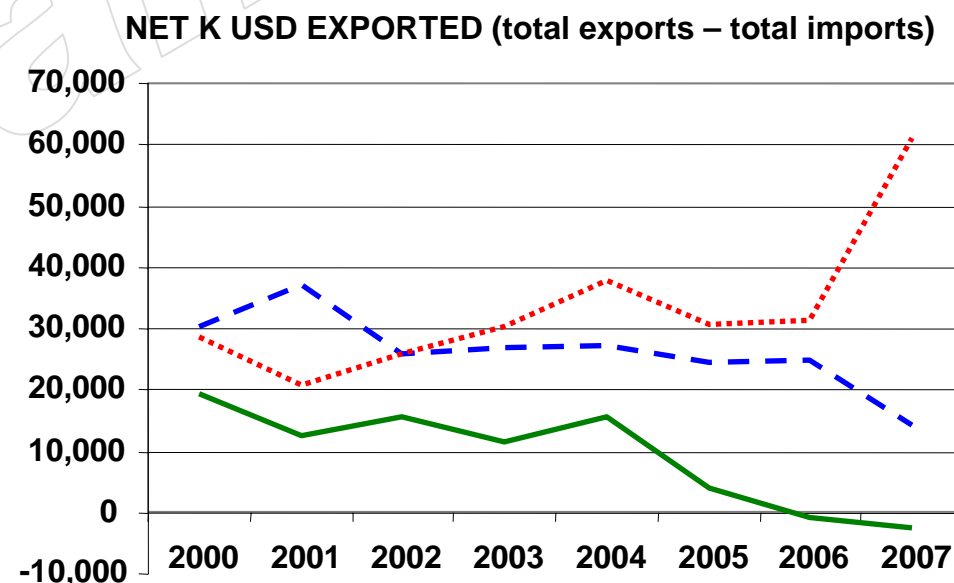
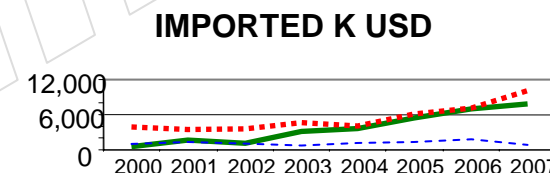
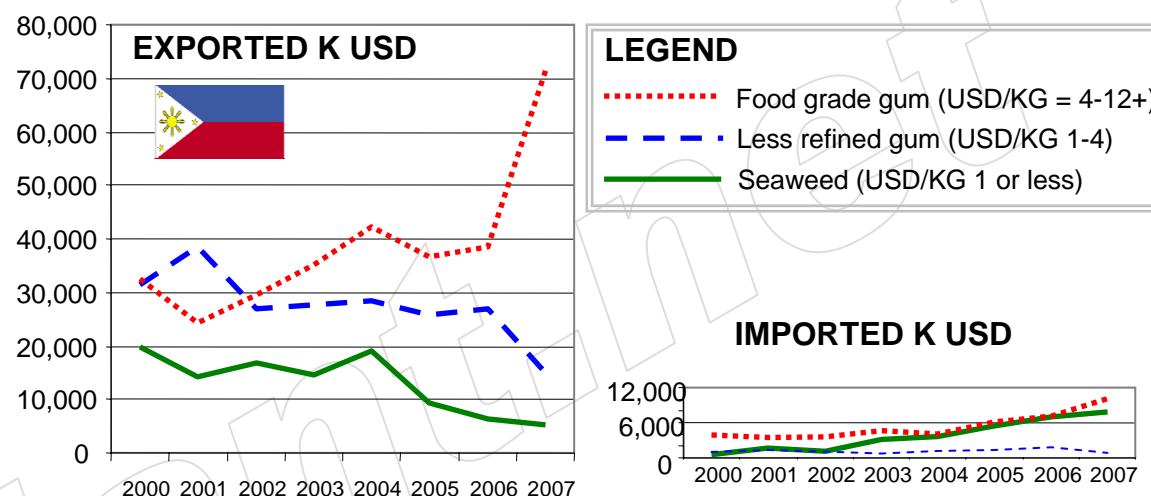
2. A notable feature of the data is that by 2006 the Philippines appeared as a slight net seaweed importer.

3. About 70% of Philippine seaweed sales went to China, Hong Kong, France, the USA and Korea.

4. Most Philippine exports were as value-added carrageenan building block products or as blended ingredient solutions rather than as raw, dried seaweed.

5. Philippine imports included both raw seaweed (mainly from Indonesia and Chile) and gums for blending. Most such imports were blended into ingredient solutions that were exported as carrageenan.

6. Philippine seaweed production appeared to decline from about 90 K MT/yr to less than 80 K MT/yr from 2000-2007.



From SEAPlant.net Monograph no. HB2B 0808 V2

## A-12. Overview of China trade balance in RAGS products

1. China was a major net importer of seaweeds and a major net exporter of value-added gums to world markets.

2. For BIMP-EAGA by far the largest flow of RAGS seaweeds from 2000-2006 was to China and Hong Kong (which still appears as a distinct jurisdiction in trade data records).

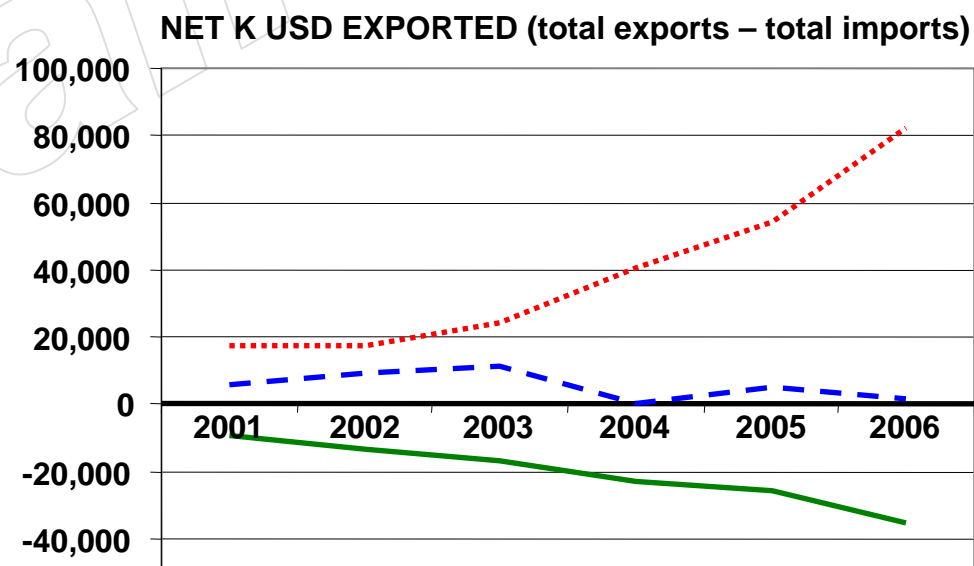
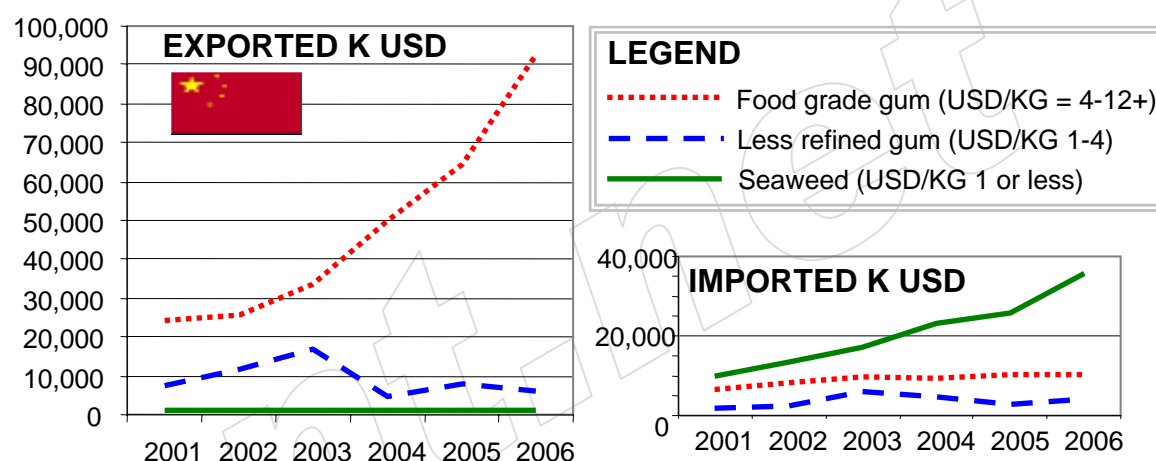
3. Indonesia was the largest source of RAGS seaweeds for China and its share has been growing. Chile and the Philippines were the next largest sources but volumes from those countries have been fairly stable from 2000-2006.

5. Although records of RAGS seaweeds moving into China from Hong Kong were scanty, industry intelligence indicated that most Hong Kong seaweed imports ended up being processed in China.

**Table right:**

percentage tonnage and value of seaweed and gums imported to China (by source; 2001-2006).

	TONS	K USD
	%	%
HK SWD	19	8
INDONESIA	38	14
CHILE	18	9
PHILIPPINES	12	4
VIETNAM	2	0
PERU	2	1
OTHER SWD	3	3
GUMS	6	17



From SEAPlant.net Monograph no. HB2B 0808 V2

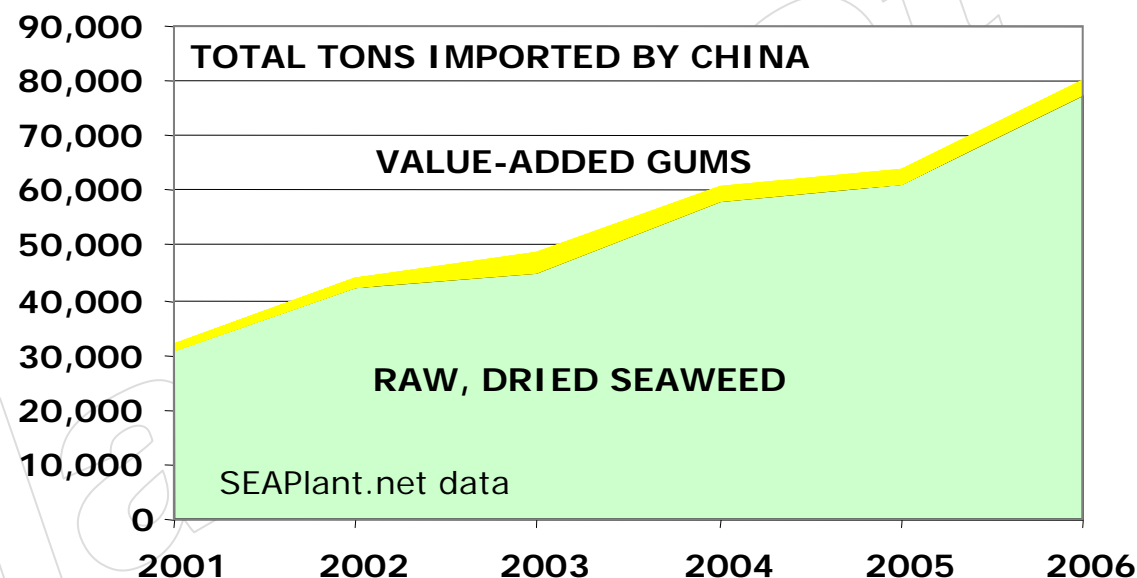


## A-13. China carrageenan – rapid growth and consolidation

### TOP 5 PROCESSORS ACCOUNT FOR ~50% OF THE MARKET

#### Industry snapshot

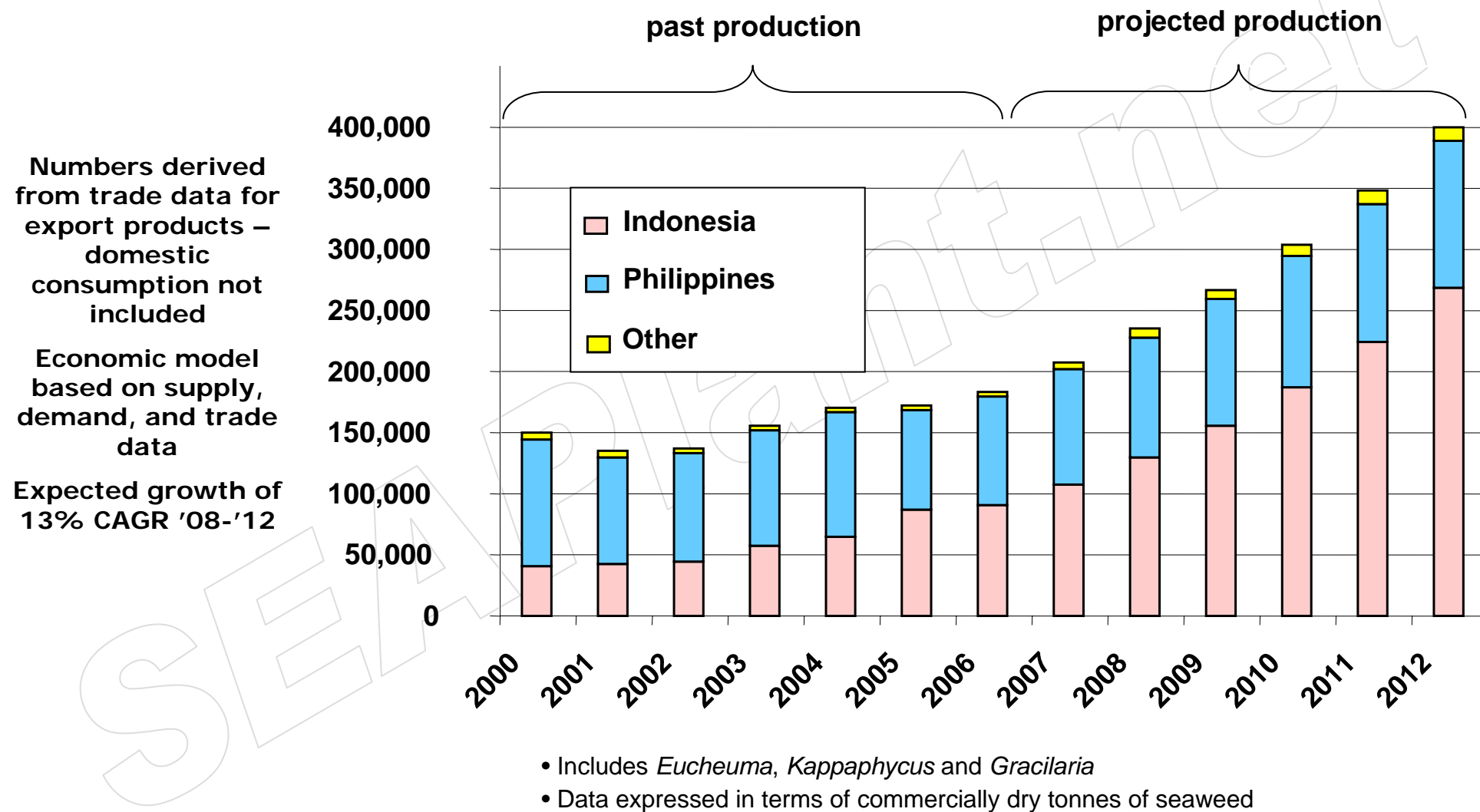
- 100+ processors 5 years ago
- 50-60 today... rapid consolidation
- All make gums & provide solutions
- Produce about 10.000 K MT of carrageenan per annum
- Export about 30% of production
- Predominantly cottonii kappa
- ~ 7 alcohol precipitation producers
- Tariffs low and dropping (7.5 – 8.0 %)
- About 130 “pure” solution providers



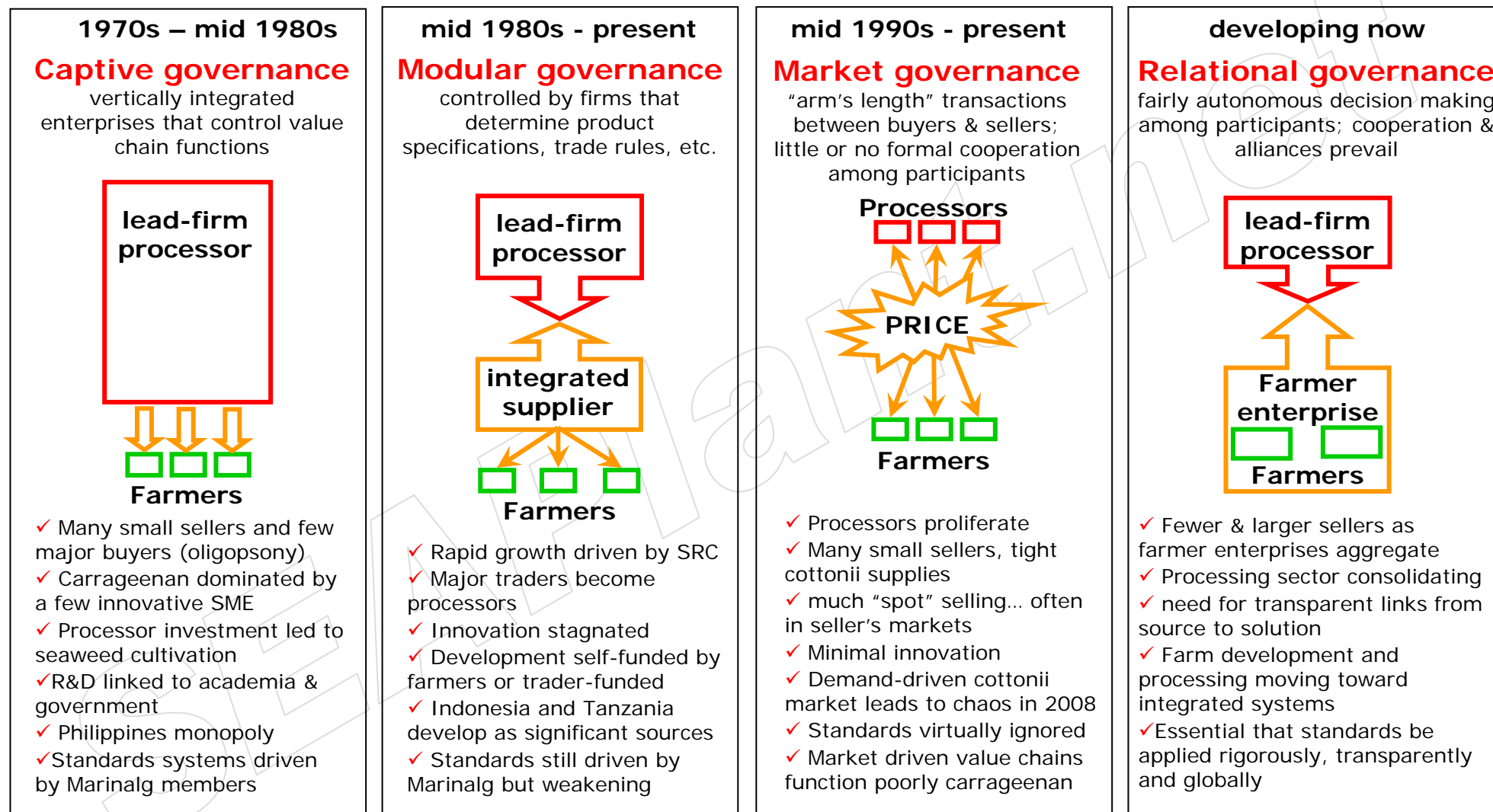
Market	Situation (From: JLJ 2006)
Meat	Industry still developing, growth of ~10% annually - Processed meat – 60% western style, 40% Chinese traditional products - Account for about 38% of carrageenan demand
Jelly	Highly popular snack in China - 20% growth rate - account for about 54% of carrageenan demand
Soft sweet	10-15% growth rate annually - China also Asia's largest soft sweets market Account for about 3% of carrageenan demand
Others	Include dairy products, milk powders, vermicelli, etc - Account for about 5% of carrageenan demand



## A-14. Tropical RAGS history & projections



## B-1. Progression of tropical RAGS value chain systems



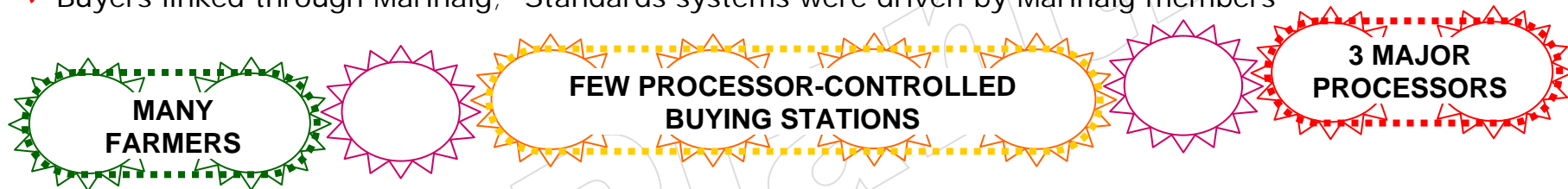
**After:** Gereffi, G., Humphrey, J. and T. Sturgeon, 2005 and Panlibuton, H., Porse, H. and E. Nadela, 2007.



## B-2. **CAPTIVE GOVERNANCE** 1970s – mid 1980s: Vertically integrated value chains

### **CAPTIVE VALUE CHAIN HIGHLIGHTS**

- ✓ Many small sellers and few major buyers (oligopsony)
- ✓ Carrageenan dominated by a few innovative SME
- ✓ Processor investment led to seaweed cultivation
- ✓ Mostly Marine Colloids (FMC now) & Genu (CP-Kelco now)
- ✓ R&D programs were linked to academia & government
- ✓ Philippines monopoly
- ✓ Buyers linked through Marinalg; Standards systems were driven by Marinalg members



The cultivation of tropical RAGS and the extraction of gums from them has gone from initial experimental trials to fully developed value chains since the early 1970s. Panlibuton *et al* (2006) have given an account of this development that was patterned after the analysis of global value chain governance undertaken by Gereffi *et al* (2005). Initially innovation in process technology and the development of seaweed farming in the tropics was driven by a few major companies that were allied through Marinalg and other alliances. These companies dominated the carrageenan business and they collaborated with local entrepreneurs to develop farms through direct investment. Benefits were realized because they had a strong market position and built robust strategic alliances. Industry standards were mediated through Marinalg but enforced by each individual processor. The availability of cultivated Kappaphycus made it possible by 1980 to introduce a disruptive technology known as semi-refined carrageenan (SRC). This lower-cost, lower-energy-consumption product was initially developed by collaboration by established carrageenan producers with end-users in the petfood industry. Single-stream processing (Figure 18) was used and this is still the industry norm. The original process technology was copied as new industry players entered the SRC business and recruited former employees, consultants and equipment suppliers of previously established manufacturers.

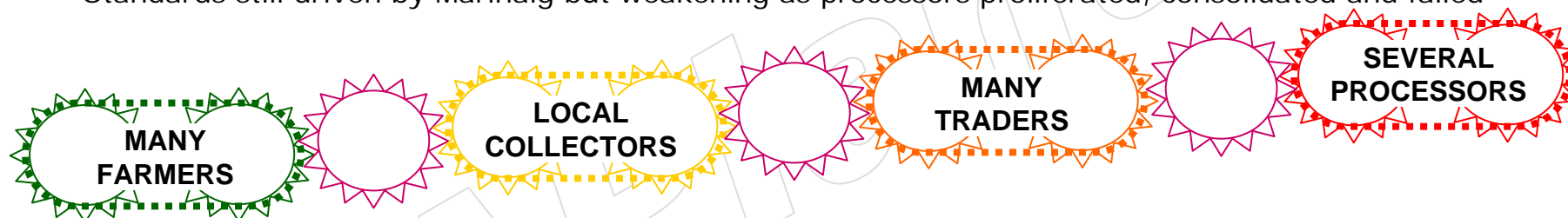




## B-3. **MODULAR GOVERNANCE** Mid-1980s to present: Value chain directed through collectors & traders

### **MODULAR VALUE CHAIN HIGHLIGHTS**

- ✓ Original few became “cash cow” divisions of large companies
- ✓ Rapid growth driven by SRC
- ✓ Major traders become processors
- ✓ Innovation stagnated as “R&D” became “copy & follow”
- ✓ Farm development done through supplier alliances and driven by price manipulation
- ✓ Development self-funded by farmers or trader-funded
- ✓ Indonesia and Tanzania develop as significant sources
- ✓ Standards still driven by Marinalg but weakening as processors proliferated, consolidated and failed



Since the mid-1980s the number of SRC and kappa-carrageenan producers has increased tremendously, especially in Asia. At the time of writing about 60 processors were operating in China; at least six significant manufacturers were in the Philippines; about 20 manufacturers were in business in Indonesia; and three were in business in Malaysia. The proliferation of Asian kappa-carrageenan capacity was partly driven by the fact that kappa-carrageenan and agar are gelling gums that can be produced in the same factories. Production of tropical *Gracilaria* species as a source of agar has increased to a level of about 40,000 dry tons per annum in Indonesia through the proliferation of simple local technologies that utilize fish ponds and shrimp ponds in a simple form of IMTA. The proliferation of new entrants into RAGS value chains resulted in successive shifts in value chain dynamics from captive governance in the mid-1980s to modular governance by the mid-1990s. Captive governance had virtually ceased by the mid-1990s. Modular value chains still comprise a small proportion of the trade in RAGS especially for the longest established processors but market governance has dominated the marketplace since the turn of the century.



## B-4. **MARKET GOVERNANCE** Mid-1990s to present: Market-driven value chains with spot-buying and weak alliances

### **MARKET VALUE CHAIN HIGHLIGHTS**

- ✓ Original few became “cash cow” divisions of large companies
- ✓ Rapid growth driven by SRC
- ✓ Major traders become processors
- ✓ Innovation stagnated as “R&D” became “copy & follow”
- ✓ Farm development done through supplier alliances
- ✓ Farm development driven by price manipulation
- ✓ Development self-funded by farmers or trader-funded
- ✓ Indonesia and Tanzania develop as significant sources
- ✓ Standards still driven by Marinalg but weakening as processors proliferated, consolidated and failed



By the mid-1990s much seaweed was being sold on the spot-market through market-governance value-chains. Systems of standards that once enabled buyers to trace and control quality broke down. As supply sources developed in less accessible island locations multiple levels of trading proliferated. Although they added little, value agents and officials were in a position to collect rents and gain trading advantage through their possession of capital, superior information and access to politically troubled regions. Competition for reliable *Kappaphycus* sources intensified greatly as market demand could not be met by seaweed supplies. By mid-2008 raw, dried cottonii and sacol prices had reached record high levels of as much as 3,000 USD/ton FOB and plant closures were occurring due to lack of raw material for making kappa-carrageenan. At the time of writing these prices had started to fall.



## B-5. **RELATIONAL GOVERNANCE** Developing now: Trend toward diverse, transparent, fair-trade value chains

### **RELATIONAL VALUE CHAIN HIGHLIGHTS**

- ✓ Fewer & larger sellers as farmer enterprises aggregate
- ✓ Processing sector consolidating (e.g. in China)
- ✓ Recognized need for transparent links from seaweed source to value solution
- ✓ Farm development and processing moving toward integrated systems (multi-stream, multi-product)
- ✓ Essential that standards be applied rigorously, transparently and globally



As the twenty-first century commenced it became clear to many in business, government and aid organizations that something was broken in seaweed-to-hydrocolloid value chains. It was equally clear that developing diverse, transparent relational value chains could drive further industry growth and could also provide livelihoods to millions of people who were under the poverty line.

Starting in 2003 the IFC-PENSA program (now IFC Advisory Services; a unit of the World Bank) set up its Seaplant Network Initiative in Indonesia to address this issue. Since then several private enterprises, government agencies, non-governmental organizations and aid agencies have commenced the support of relational value chain development. SEAPlant.net Foundation became independent in 2008 and is focusing on IMTA development through relational value chains.

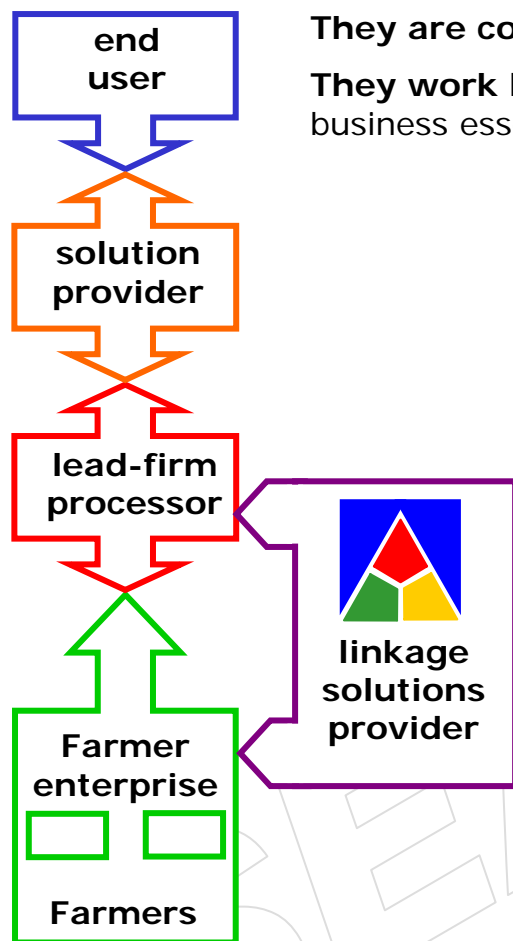


## B-6. Relational links work well in seaweed-to-gums value chains

**They predominate** between solution-providers and end-users

**They are common** between processors and solution-providers

**They work best for farmers if they are aggregated** into robust enterprise units with access to business essentials such as those shown below:



### Communication & logistics

- ✓ voice-over-Internet communication
- ✓ workshops and meetings
- ✓ training farmers in IT skills
- ✓ connecting farmers to logistic networks
- ✓ transport systems

### Fair finance

- ✓ warehouse receipting systems
- ✓ crop insurance
- ✓ financial products geared to MSME
- ✓ linkages to sources of assistance
- ✓ electronic banking

### Essential goods & social services

- ✓ electronic buy – sell systems
- ✓ education & training systems
- ✓ health care other social services
- ✓ regional collection & distribution hubs

### Strategic alliances

- ✓ alliance management systems
- ✓ websites & linkage tools
- ✓ E-business software solutions
- ✓ alliance network tools & solutions

### Fair trade in global markets

- ✓ brand management
- ✓ adding value near crop sources
- ✓ secure electronic transaction systems
- ✓ traceable transactions & product flows
- ✓ testing, verification & certification
- ✓ market knowledge & information
- ✓ product innovation & development
- ✓ marketing & sales tools & services

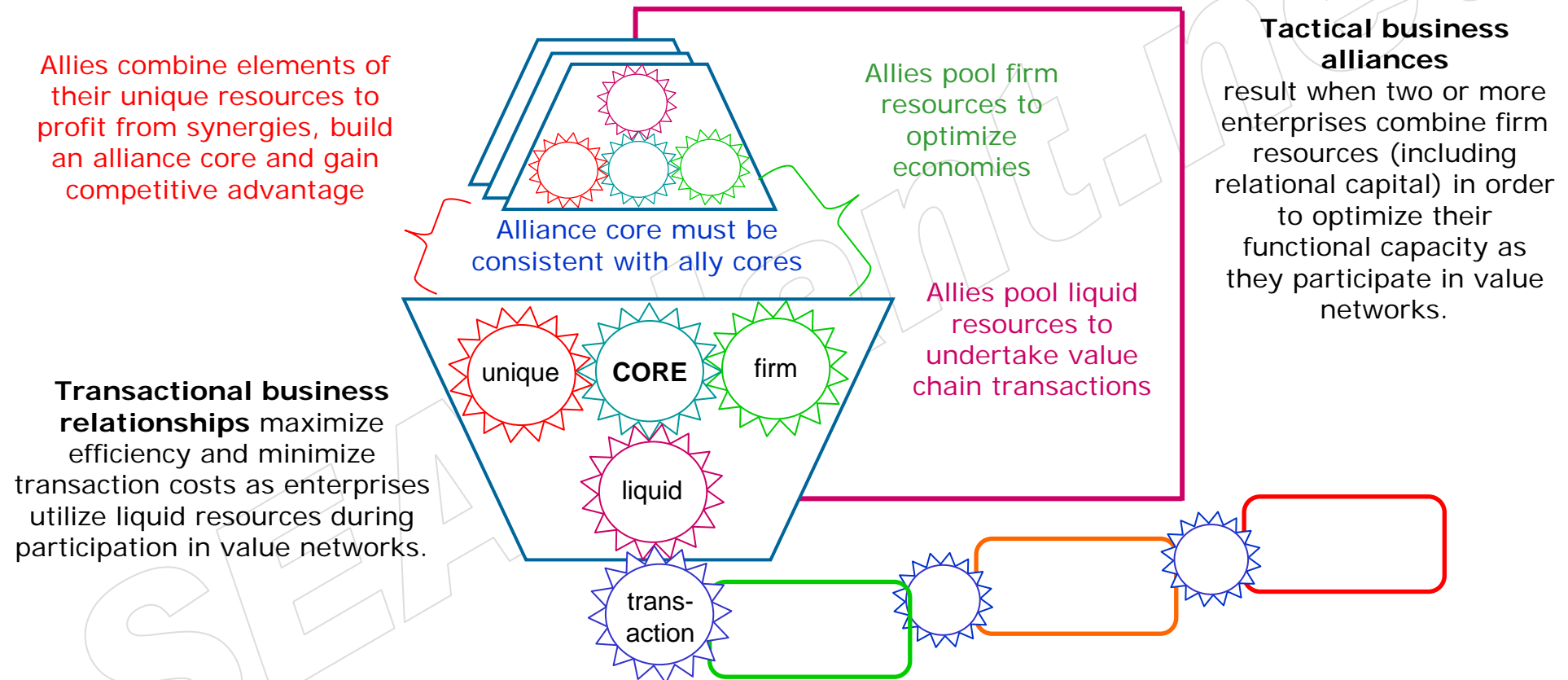
### Science & technology

- ✓ "good practices" systems
- ✓ education & training products
- ✓ innovative process & product technology
- ✓ crop science & technology



## B-7. **RELATIONAL GOVERNANCE** works through alliances

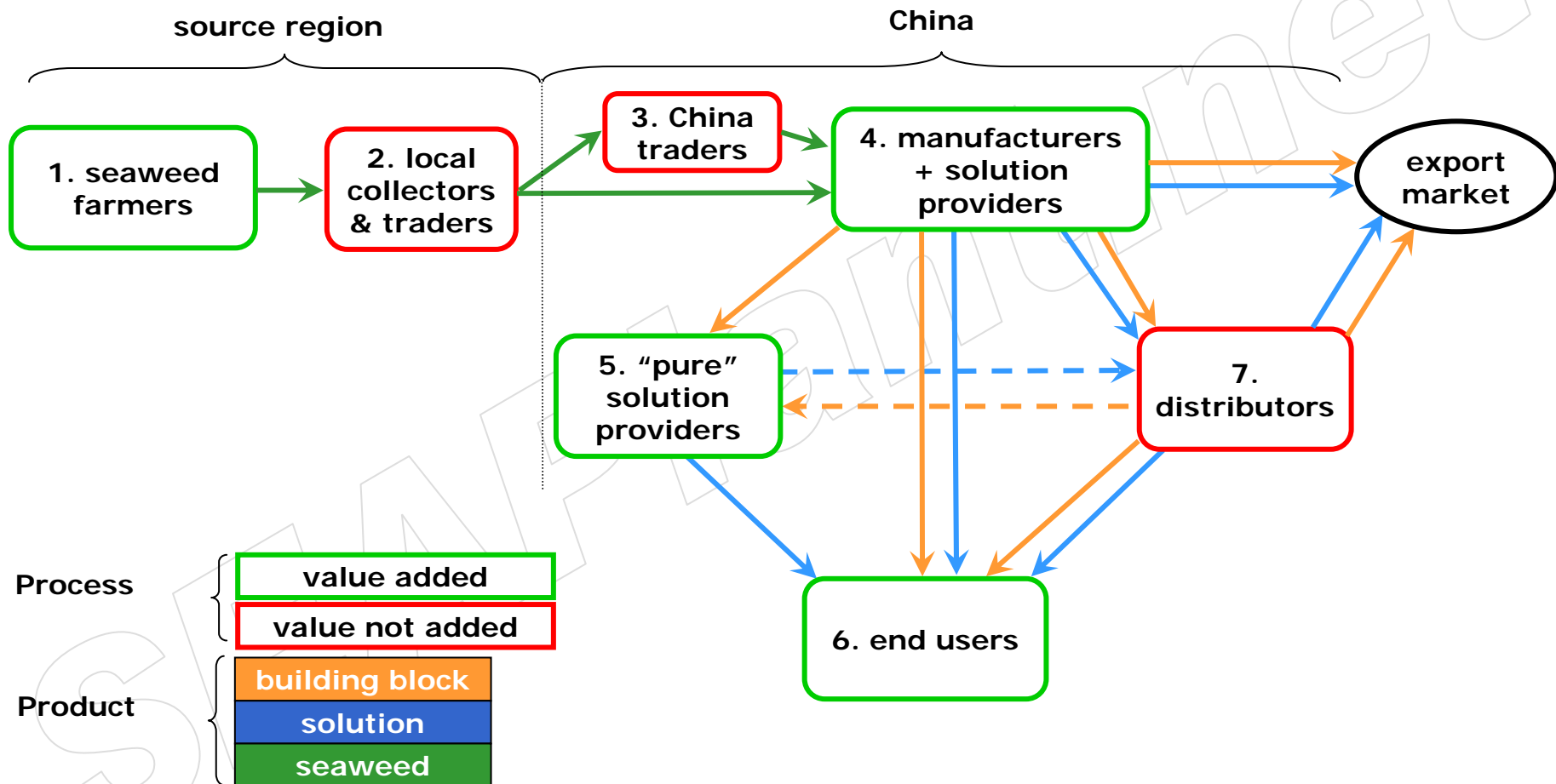
**Strategic business alliances** result when two or more enterprises combine core values and unique resources. They then pool firm + liquid resources to jointly develop and operate an enterprise that seeks competitive advantage in specified value networks.



**Learn more in:** *A Ten-step Functional Framework for building Ventures and Alliances among Seaplant Enterprises.*  
SEAPlant.net Monograph No. HB2C 0808 V1

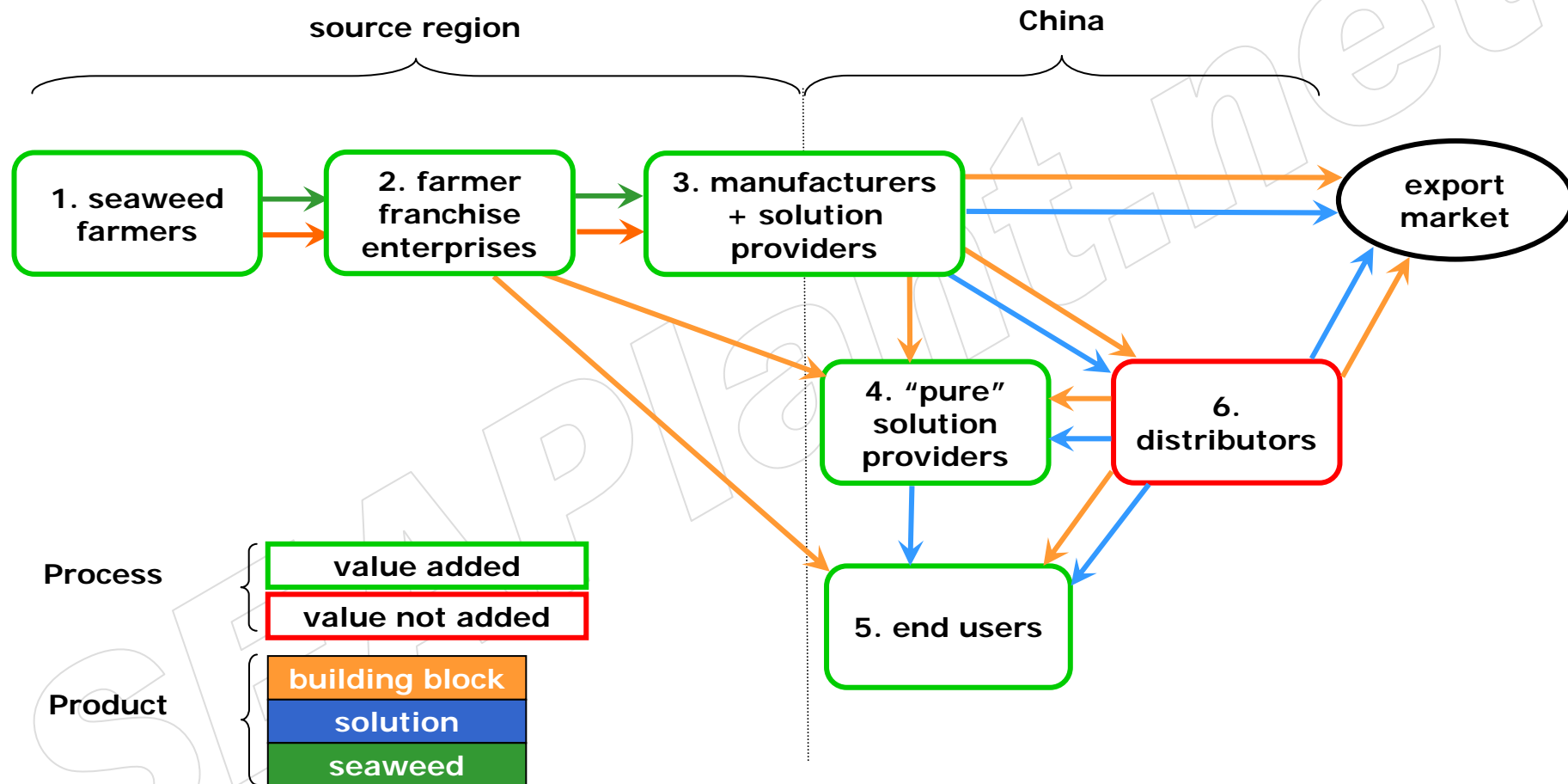


## B-8. A typical “**market governance**” value chain





## B-9. How a “relational governance” value chain can operate



## B-10. Value chain failures that led to the 2008 “cottonii crisis”

### INNOVATIVE DEVELOPMENT YIELDED TO THE “TRADER MENTALITY” AND “COPY-CAT” TECHNOLOGY

Research and development has stagnated since the innovative SME that once dominated the carrageenan business were purchased by large multi-national owners during the late 1970s and into the 1980s. Those events coincided with a proliferation of SRC producers first in the Philippines and later in Indonesia, China, Chile and Malaysia.

Since the advent of semi-refined carrageenan technology much process capacity developed on the basis of technology obtained from former employees, consultants and equipment suppliers of previously established manufacturers. This process was facilitated by multi-national owners of formerly innovative carrageenan enterprises that cut back on R&D and farm development activities and also discharged many senior, long-term technical and management staff.

### PROCESSORS CEASED MAJOR INVESTMENT IN SEAWEED SOURCES

The proliferation of new entrants into RAGS value chains resulted in successive shifts in value chain dynamics from captive governance in the mid-1980s to modular governance by the mid-1990s then market governance by about 2001. The disintegration of exclusive value chain relationships caused side-selling to become a major problem both for the original Marinalg companies and for subsequent entrants as well. Investments in process development and farm development ended abruptly by the mid-1990s because investments could no longer be protected and internalized by private investors. Investment in farm development also diminished because the larger hydrocolloid producers decided that seaweed farming comprised aquaculture and they did not want to be in the aquaculture business.

### MARKET GOVERNANCE = FAILED RAGS VALUE CHAINS

Carrageenan and agar are performance chemicals that are generally marketed as components of ingredient solutions. Product performance and production costs cannot be optimised unless seaweed raw material sources are transparently linked from farms through processors to solution providers and end-users. Market-governance value chains do not result in such links. Captive value chains are difficult to establish in today's world and modular value chains function little better than market-governance chains. Relational governance appears to be the best option for RAGS value chain development.

#### Moving beyond “copycat” technology



RAGS technology and product development have been stagnant for almost 30 years

multi-stream processing and IMTA innovations can have positive value-chain impacts



C-1. A very useful breakthrough would be  
**robust Kappaphycus cultivars that are less seasonal**



need to screen wild stocks for new cultivars

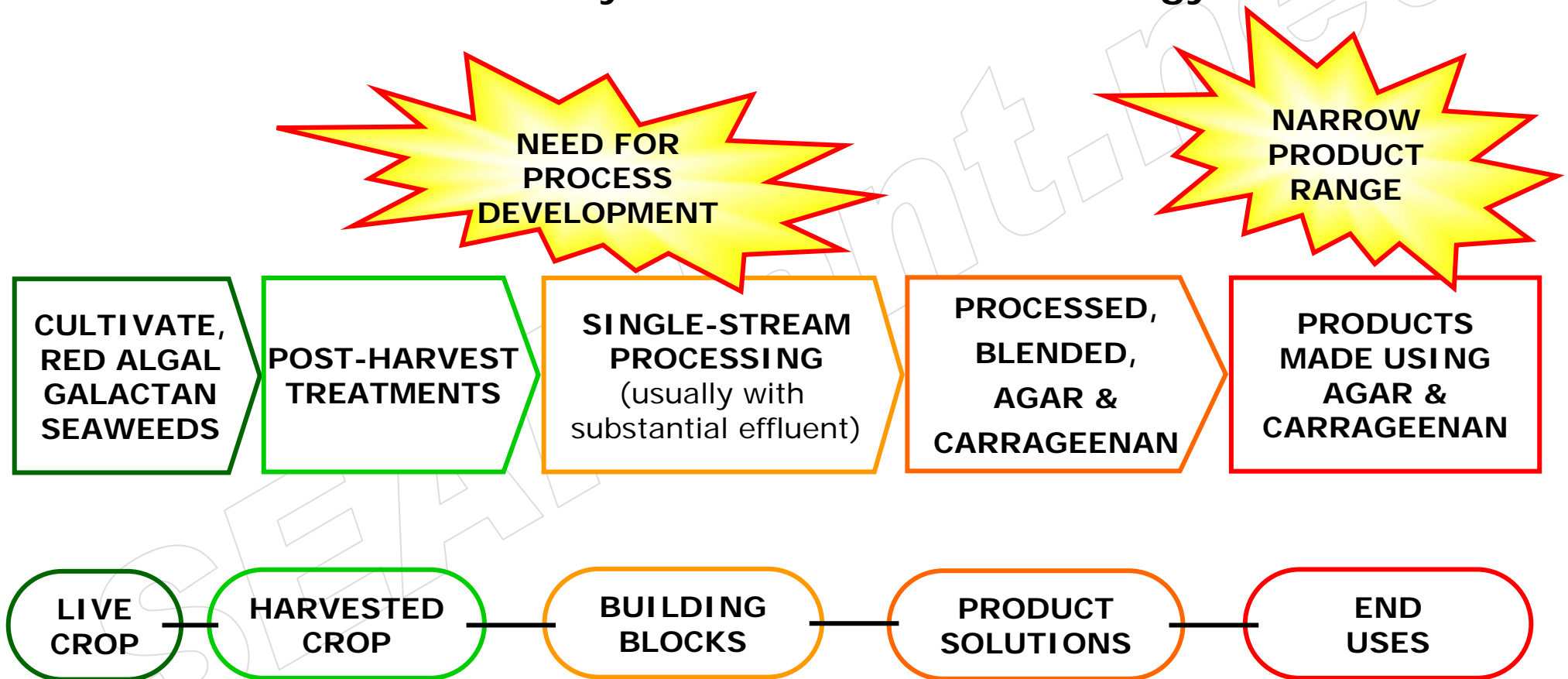


that grow as vigorously as Eucheuma during all seasons

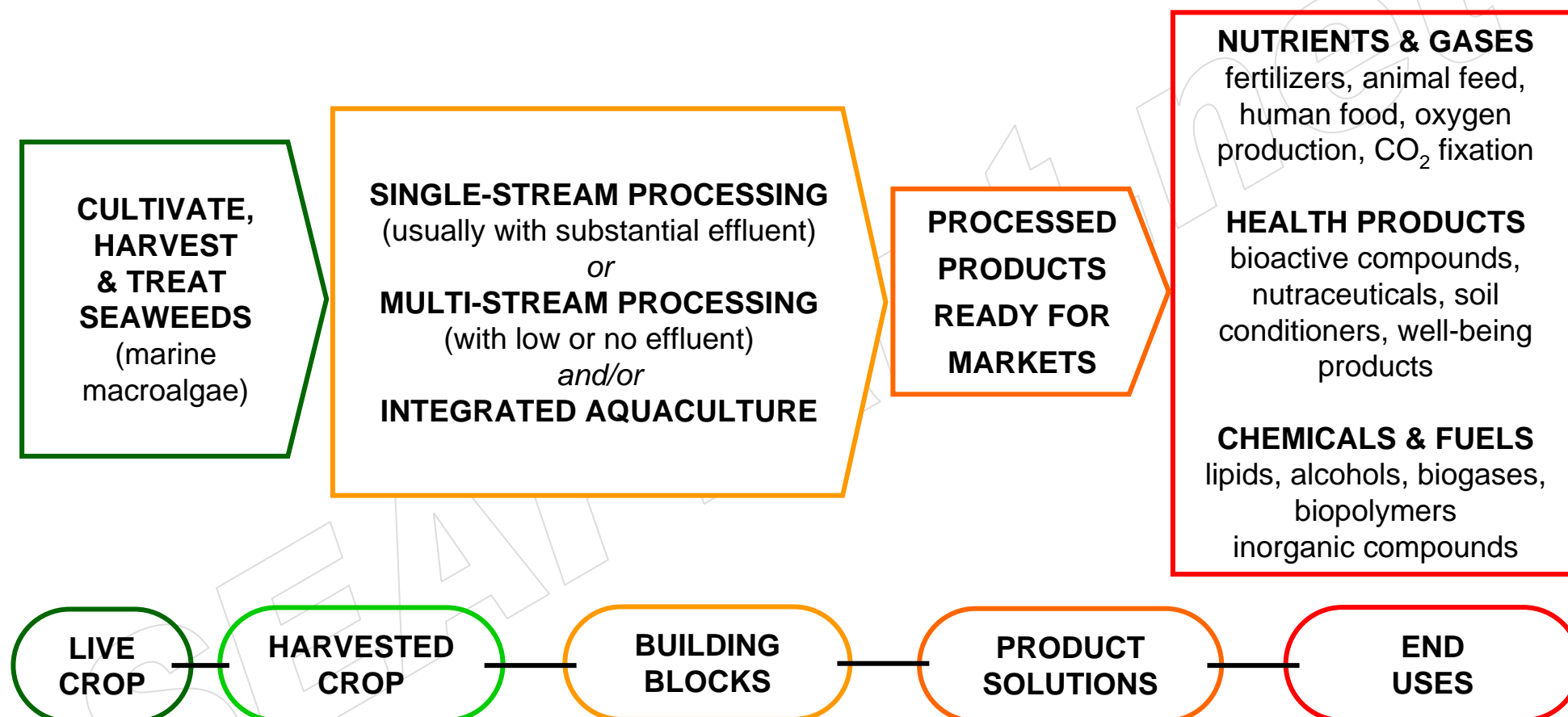


## C-2. developing beyond a narrow range of opportunities

**R & D must move the industry  
beyond decades-old technology**



### C-3. Diversification = more products & standards for local, regional and global markets



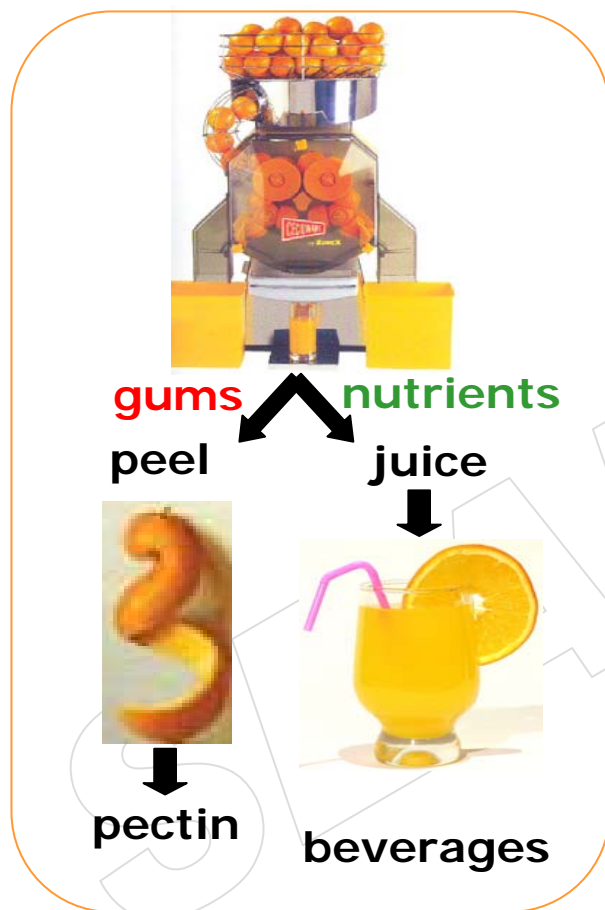
**More about IMTA:** *Tropical Red Seaweeds as a Foundation for Integrated Multi-trophic Aquaculture (IMTA): Four propositions and an action plan for this major opportunity in the Coral Triangle* SEAPlant.net Monograph no. HB2E1008V1





C-4. Multi-stream processing means two value streams,  
lower production cost - low water requirement - good quality

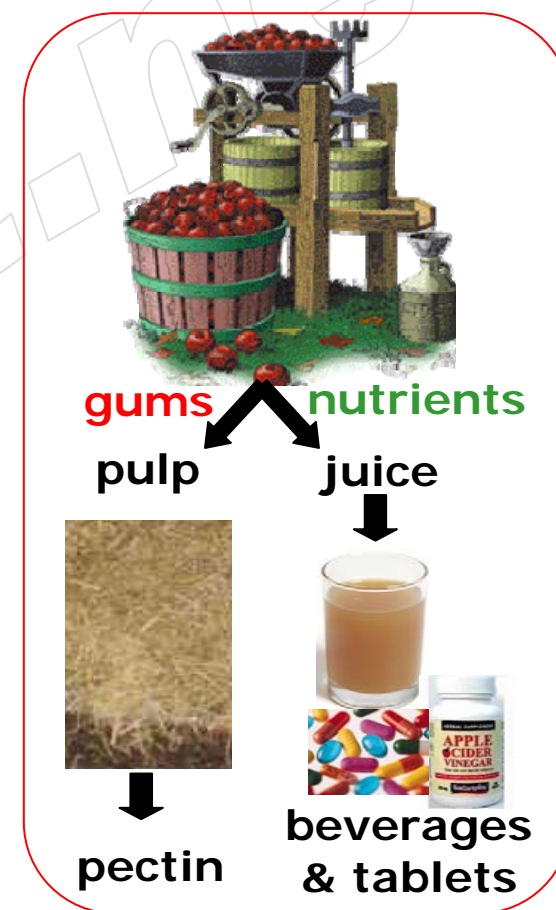
### **citrus fruits**



### **RAG seaplants**

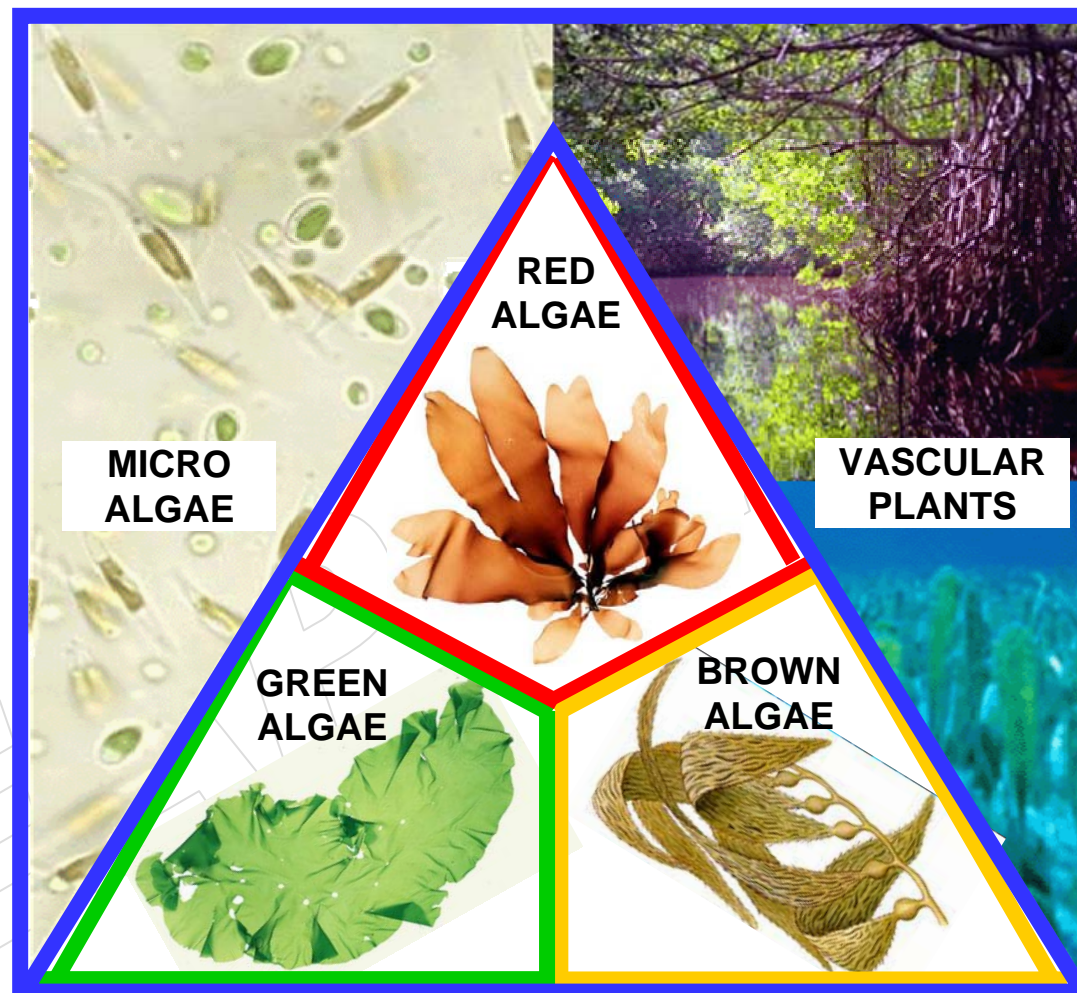


### **apples**





## C-5. basis of Integrated Multi-Trophic Aquaculture (IMTA)



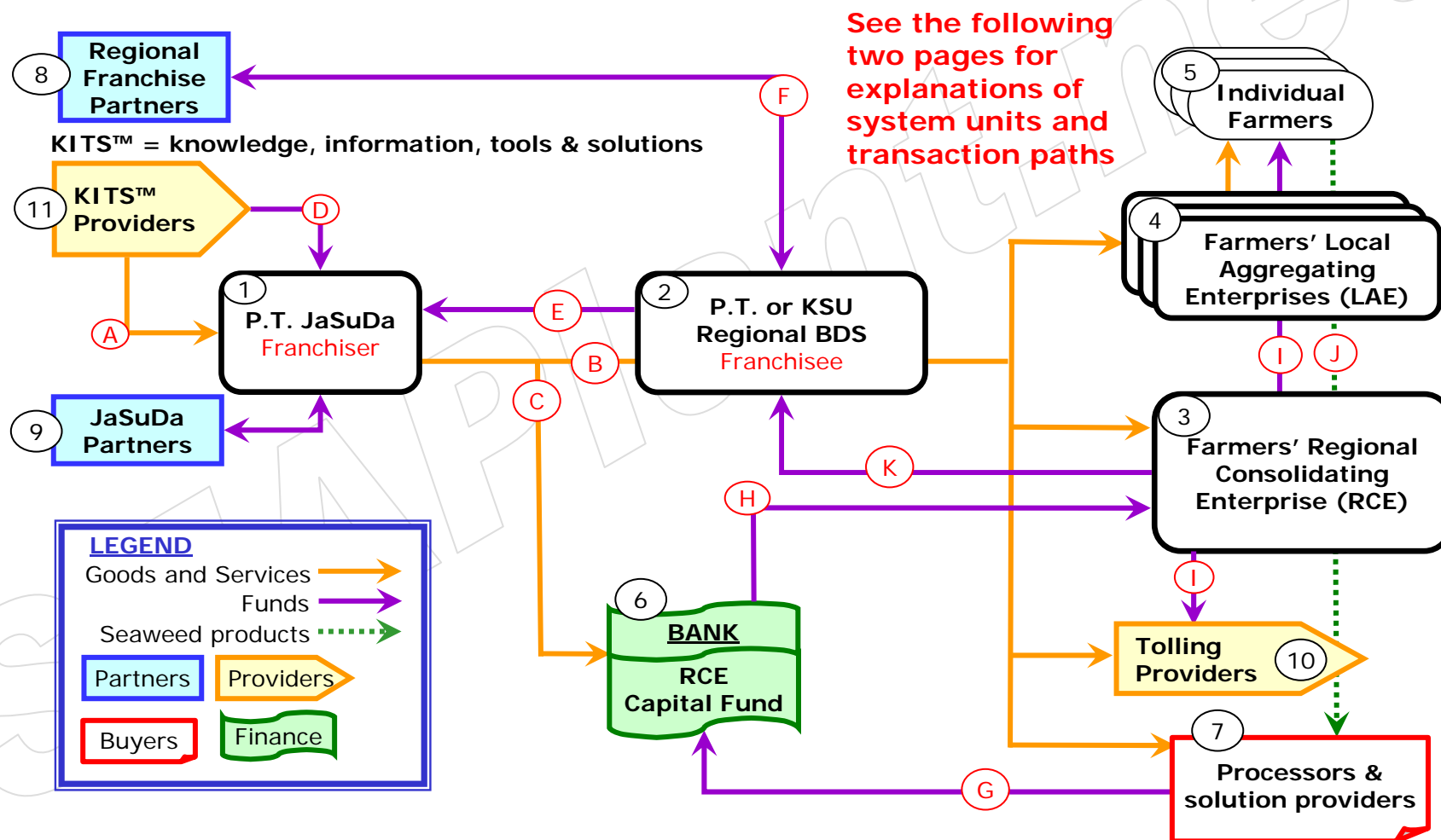
**More about IMTA:** *Tropical Red Seaweeds as a Foundation for Integrated Multi-trophic Aquaculture (IMTA): Four propositions and an action plan for this major opportunity in the Coral Triangle* SEAPlant.net Monograph no. HB2E1008V1



## C-6. JaSuDa™ franchise system schematic

### Relational-governance value chains that work...

SEAPlant.net has developed the JaSuDa™ system over several years starting with farmers' groups in East Indonesia. JaSuDa is a contraction of "Jaringan Sumber Daya" which is Bahasa Indonesia for "sourcing network".



## C-7. JaSuDa™ franchise system component organisations

### **FRANCHISE CORE ENTERPRISES**

1. P.T. JaSuDa™ is the franchising and e-commerce company.
2. P.T. Regional BDS Franchise is the regional franchisee.
3. The Regional Consolidating Enterprise is a cooperative or LLC for seaweed and seaweed products that links LAE to markets and other business essentials and also undertakes value-adding functions.
4. Farm enterprise that produce seaweed and seaweed products.
5. Local Aggregating Enterprises (LAE) that unite farmer MSME into sustainable business units (e.g. cooperatives).
6. Banks where accounts are kept and fund transfers are undertaken.

### **BUYERS MAY ALSO BE PARTNERS**

7. Buyers of seaweed and seaweed products. If the buyers is also a tolling provider (11) or a partner (9, 10) they can have right of first refusal on all seaweed moving through the auction system.

### **OTHER PARTNERSHIP OPTIONS**

8. Partner/investor in the P.T. Regional BDS Enterprise.
9. Partner/investor in P.T. JaSuDa.

### **PROVIDER OPTIONS**

10. Tolling providers or third-party contractors that provide services such as warehousing, processing and logistics.
11. KITS providers sell their goods and services through the JaSuDa franchise system.

**Relational-governance value chains that work...**



## C-8. Flow of goods, services & funds through the JaSuDa™ system

- A. KITS providers can supply their goods and services through the JaSuDa franchise system. For this service JaSuDa will charge a reasonable and transparent fee.
- B. KITS will pass through regional franchise PT enterprises as specified in franchise agreements.
- C. JaSuDa will retain an independent auditor to ensure effective governance of funds.
- D. Some KITS will pass through JaSuDa as specified in franchise agreements.
- E. Tolling fees, fees for services, transaction fees and payment for goods will pass through the PT BDS to JaSuDa as specified in franchise agreements.
- F. JaSuDa is seeking partner investment for regional franchise development and expansion.
- G. Revenues from seaweed product sales will go to accounts of the RCE where capital funds will be built.
- H. Funds from the bank will feed into the system through the RCE.
- I. The RCE will disburse payments to farmers and also fees to the PT BDS and the tolling partners.
- J. The seaweed crop will flow on a direct, traceable path from farmers to buyers.
- K. The RCE will pay fees to the P.T. Regional BDS Franchisee as determined in franchise and supply agreements.

**Relational-governance value chains that work...**





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**Contact us at:** Seaplant.net Foundation, Graha Pettarani Lt. V, Jl. Andi Pangerang Pettarani 47, Makassar, Sulawesi Selatan, Republic of Indonesia, Tel : (62 411 ) 425280 –84 Fax : (62 411 ) 425269, Email: [contact@seaplant.net](mailto:contact@seaplant.net), URL: <http://www.seaplant.net>



# Attachment A: Seaplant value chain basics

## **PREAMBLE - The need for understanding value chains**

Seaweed farming in the Coral Triangle is widely perceived as a micro-enterprise activity that requires micro-financing and very basic Business Development Services (BDS). In fact many seaweed farming enterprises are becoming substantial. A well-structured farmer cooperative may have 200 or more members/owners and can produce revenues of more than 500 K USD per month. Furthermore large aggregating enterprises are in the process of joining regional consolidating enterprises that will make SRC and perhaps also RC. They are “medium” enterprises that require serious financing and BDS. An understanding of how seaweed-to-hydrocolloid value chains function is essential to the members and managers of such enterprises.

This attachment was written as basic instructional material for BDS serving sea farmers who are becoming managers of local aggregating enterprises (LAE) and regional consolidating enterprises (RAE) such as cooperatives and farmer-owned joint-stock companies in tropical seaweed-to-carrageenan value chains. For the most part it also applies to tropical seaweed-to-agar value chains.

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### **Seaplant value chain basics:**

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Page 40 Process functions are the basic units of value chains

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Page 42 Summary of value chain structure

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Page 44 Transaction functions are 2-way...

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Page 46 “Liquidity chains” link processes & recycle liquid resources

Page 47 KITS are enterprise resources

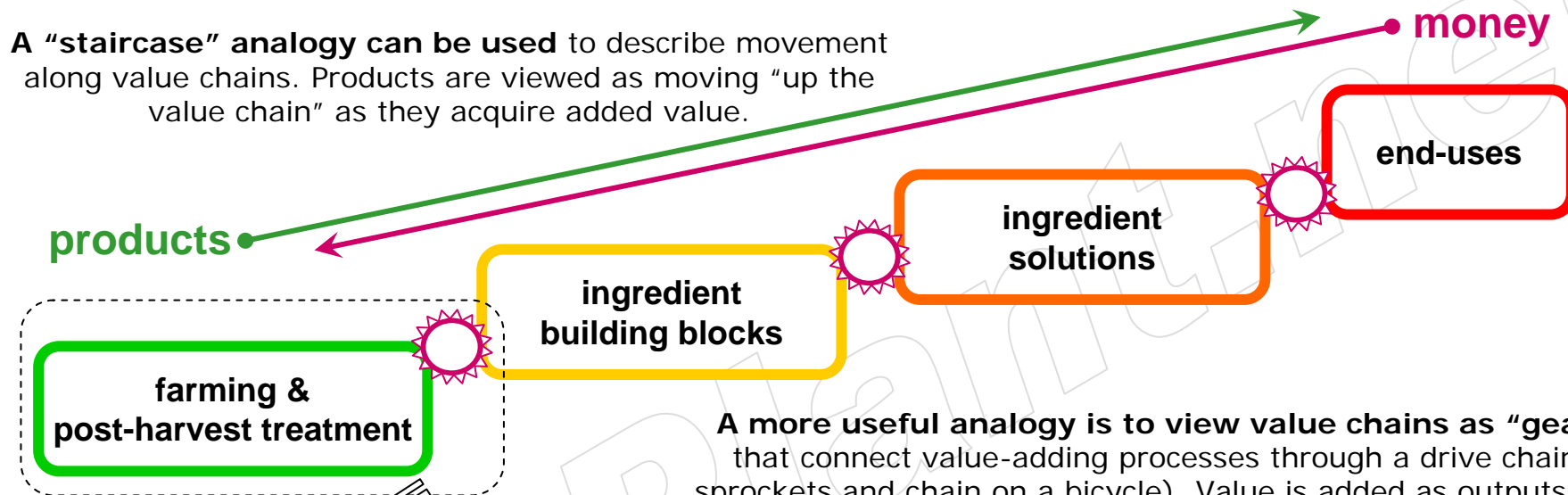




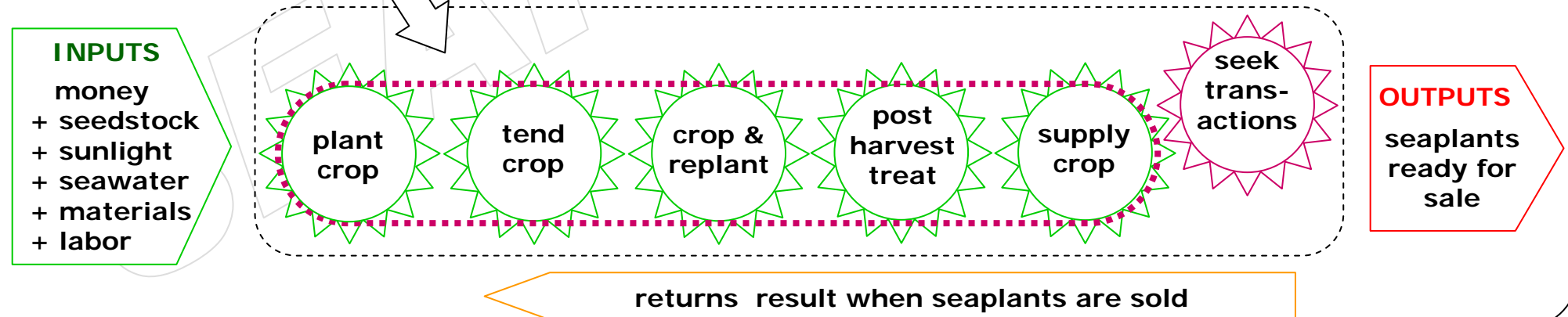
## Attachment A: Seaplant value chain basics:

Value chains lead from foundation links through other links to end users  
Processes are interconnected functions... like gear chains

A “staircase” analogy can be used to describe movement along value chains. Products are viewed as moving “up the value chain” as they acquire added value.



A more useful analogy is to view value chains as “gear chains” that connect value-adding processes through a drive chain (like the sprockets and chain on a bicycle). Value is added as outputs from lower-value links link become inputs for the next links up the chain. The example below is the first link in a RAGS value chain.



## Attachment A: Seaplant value chain basics:

Process functions combine "KITS" and are the basic units of value chains

knowledge + information + tools + solutions (KITS) = actions

several coordinated actions = a function

**"Knowledge"** is a product of education and intellect. Knowledge enables facts to be utilized, tools to be used and solutions to be implemented.

**EG. farmer Knowledge** includes items such as agronomy methods, accumulated experience in dealing with weather, experience with different planting sites and relationships with other seaplant industry stakeholders.

**"Information"** is the mass of facts that enables the effective use of knowledge in developing or obtaining tools and formulating solutions.

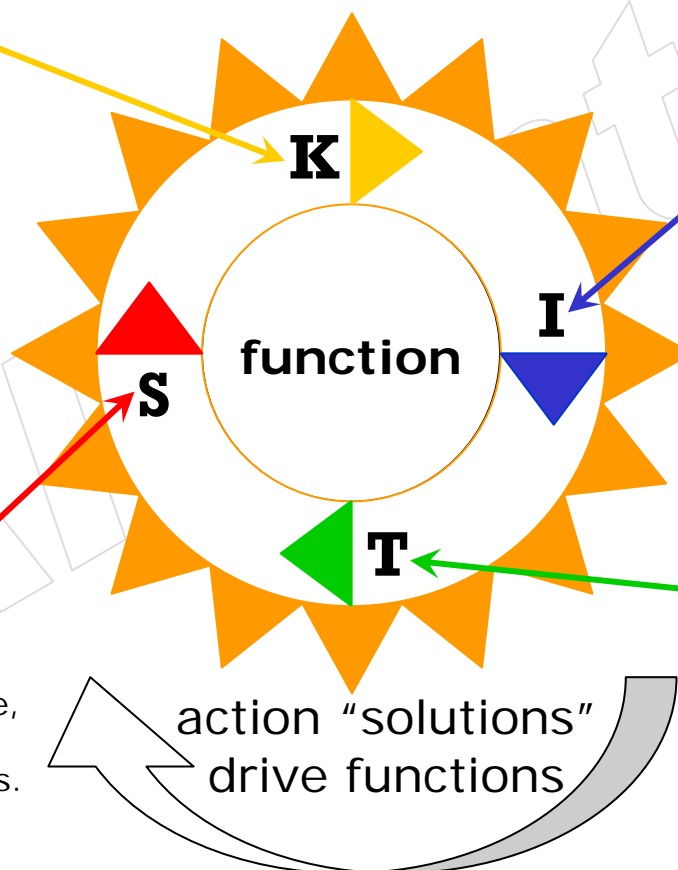
**EG. farmer information** includes current seaplant prices, market preferences, tide tables, weather forecasts and shipping schedules.

**"Solutions"** are the integrated combinations of knowledge, information and tools that result in **"actions"**.

**EG. farmer solutions** use knowledge, information and tools to actually DO something... namely to grow seaplants. Solutions include "tender loving care (TLC) in tending the crop.

**"Tools"** are the implements or "effectors" that are used to implement solutions... including money.

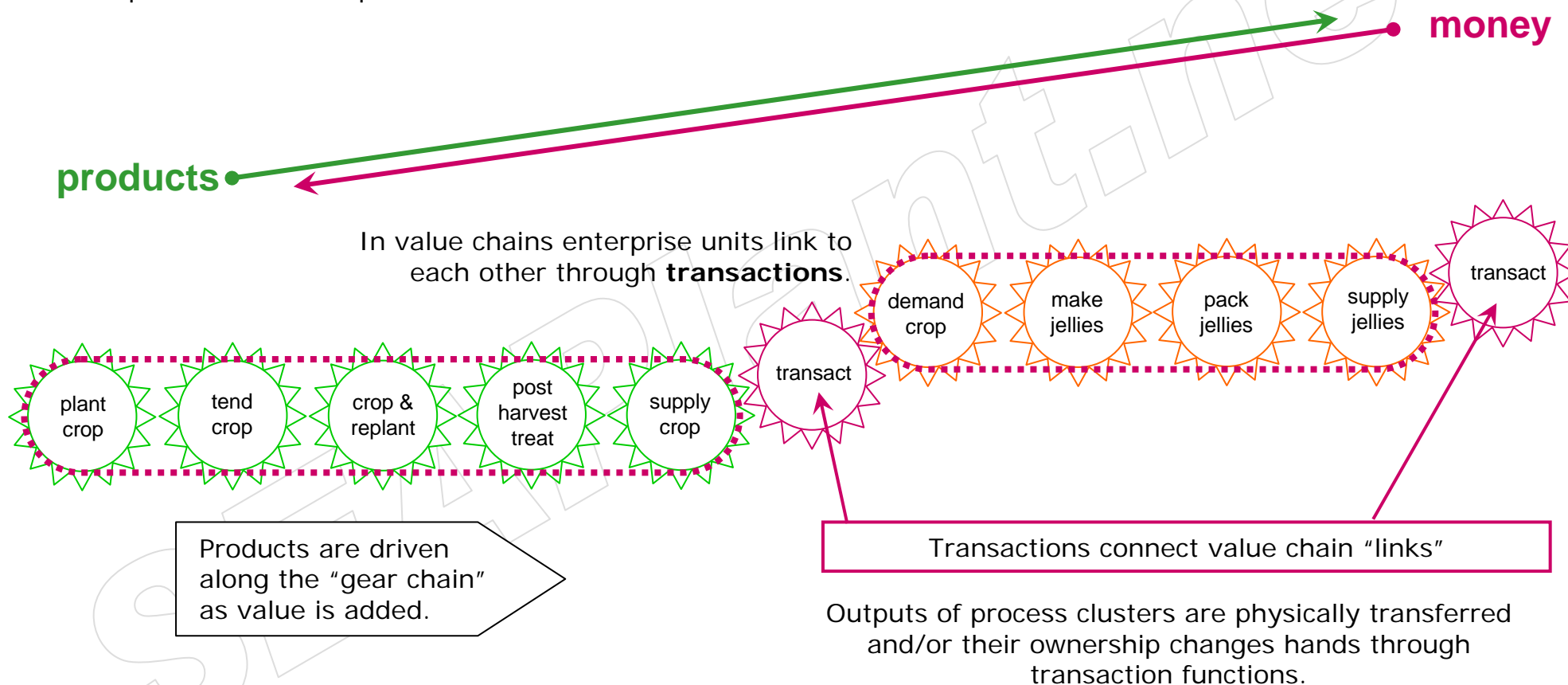
**EG. farmer tools** include planting lines, boats and farm systems in the sea.



# Attachment A: Seaplant value chain basics:

## Process clusters form enterprise units... the “links” in value chains

Clusters of processes combine within **enterprise units** that make products and comprise **links** in value chains.



## Attachment A: Seaplant value chain basics: Summary of value chain structure

Knowledge + Information + Tools + Solutions (**KITS**) = **actions** that drive **Functions**



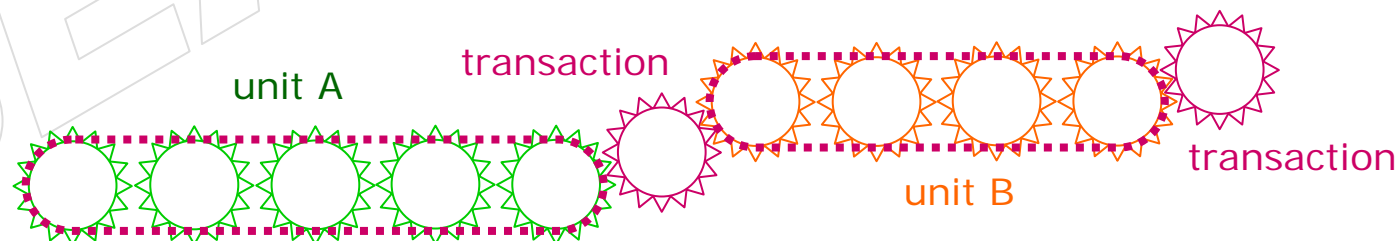
Interconnected functions combine in **processes**



**Value chain links** are clusters of processes that comprise **enterprise units**



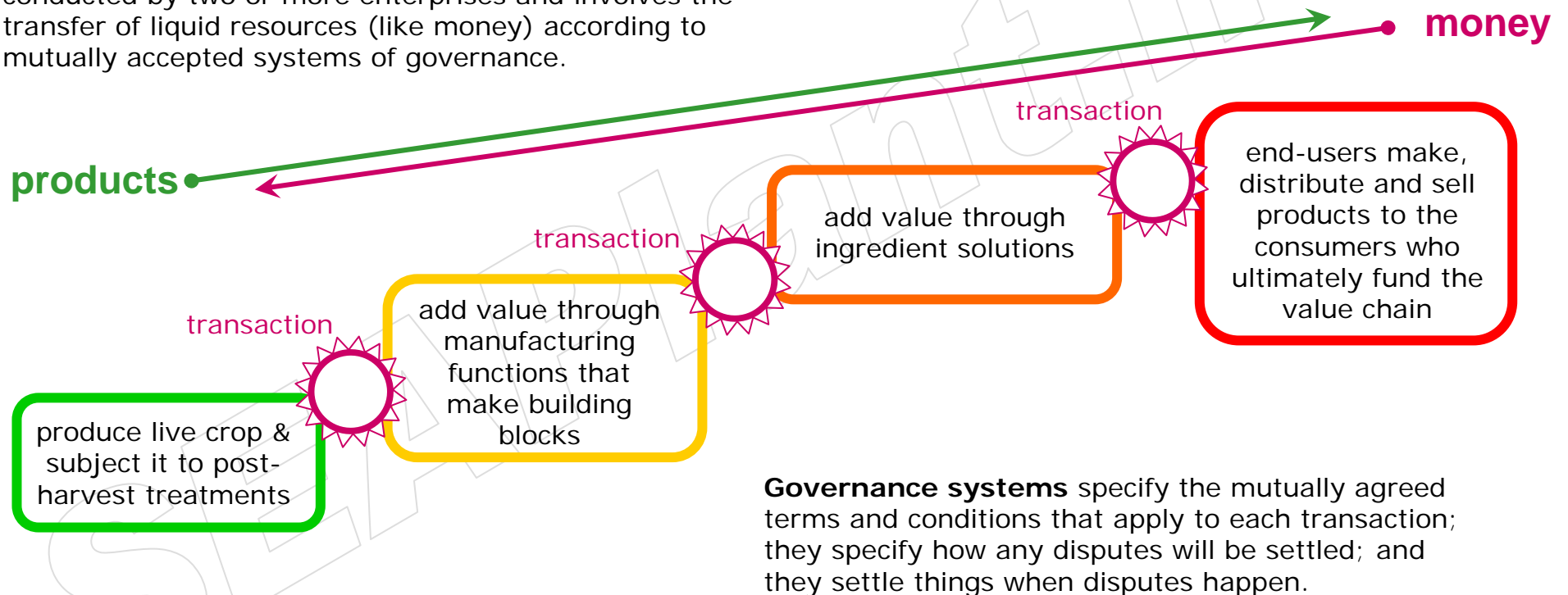
Value chain links are enterprise units that connect to each other through **transactions**



## Attachment A: Seaplant value chain basics: Governed transactions in RAGS value chains

Inside every seaplant value chain runs a chain of “**governed transactions**”. The rate and volume of transactions determine how fast and how big a value chain can be.

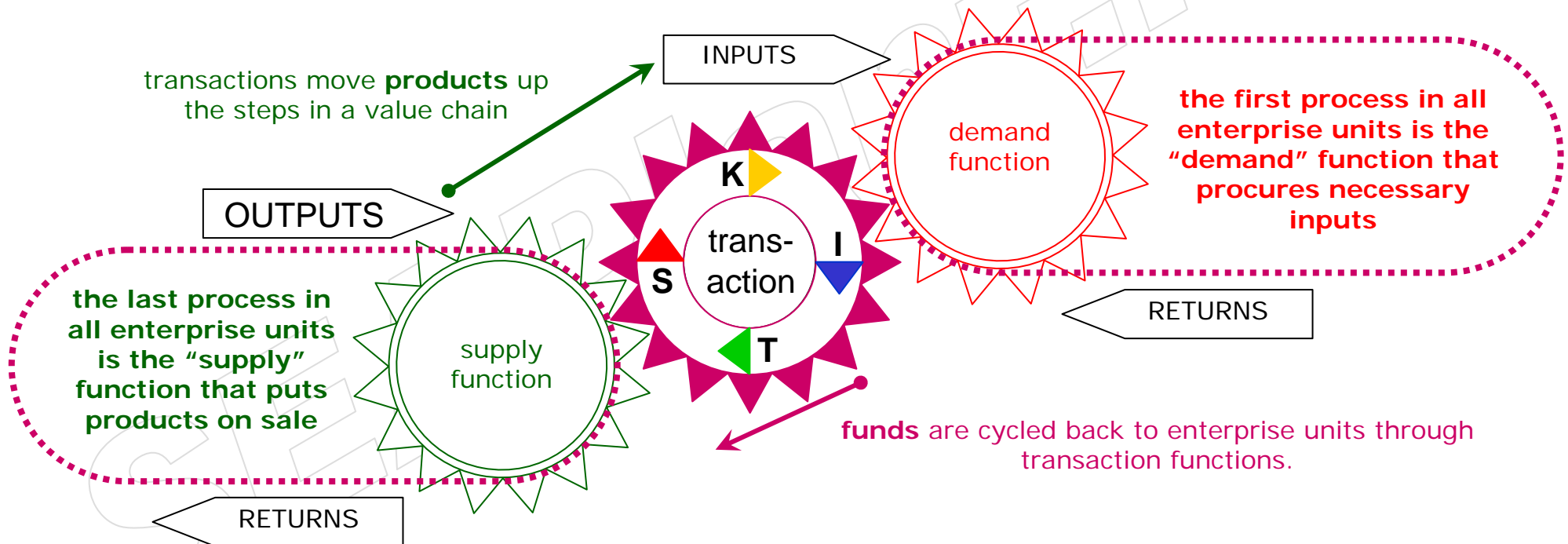
**A business transaction** is a logical unit of business that is conducted by two or more enterprises and involves the transfer of liquid resources (like money) according to mutually accepted systems of governance.



## Attachment A: Seaplanet value chain basics: Transaction functions are two-way...

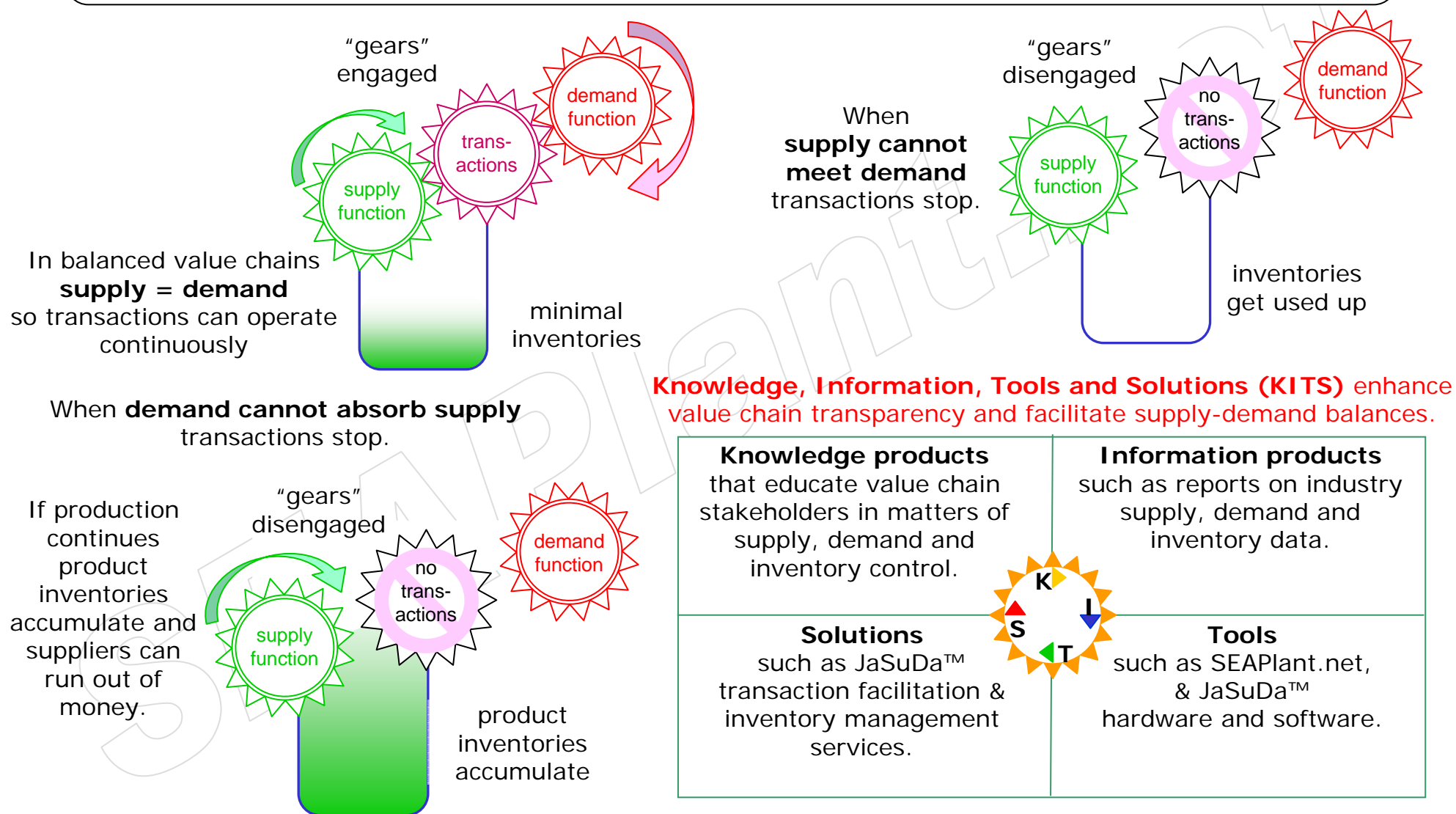
Transaction functions link the clusters of process functions that define enterprise units. Transactions are “two way” functions that move products up the chain and liquid resources (media of exchange) down the chain.

It is the rate and volume of “governed transactions” that determines how fast and how big a value chain can be.





# Attachment A: Seapant value chain basics: Transactions, inventories, supply & demand ...



## Attachment A: Seaplant value chain basics: “Liquidity chains” link processes & recycle liquid resources

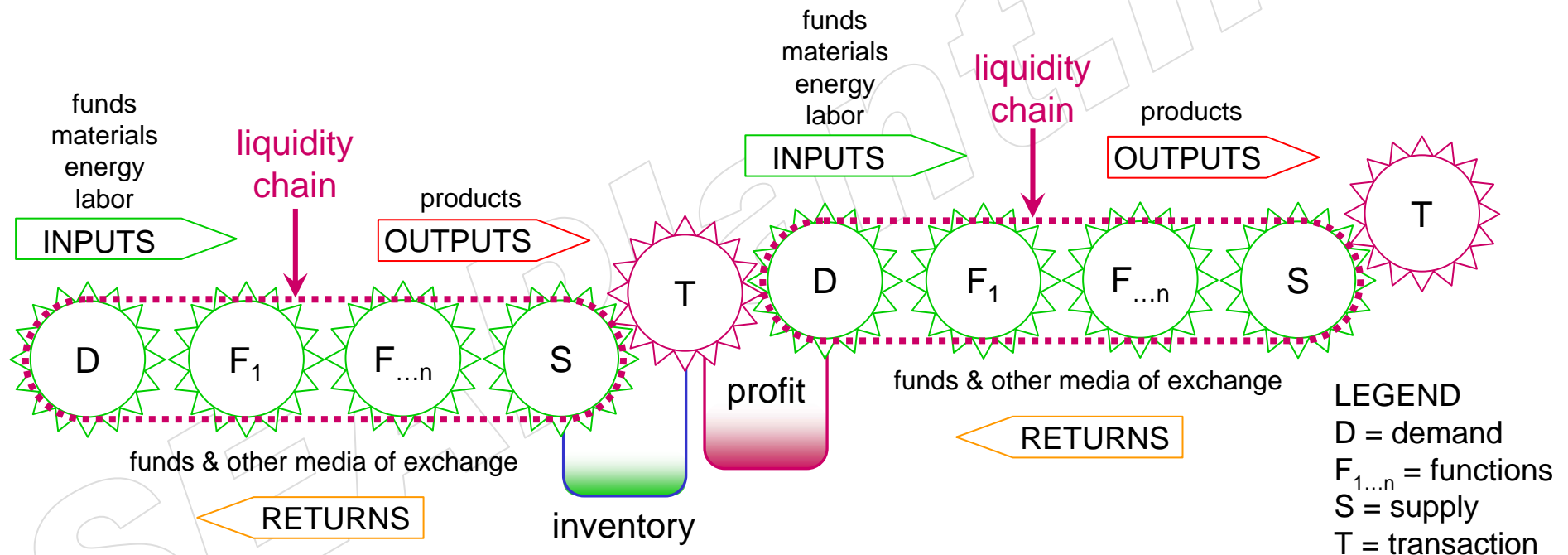
Funds \*, raw materials, energy, labor and other liquid resources are **inputs** that go into processes.

Products are the **outputs** of processes.

Transactions **return** liquid resources to the enterprise.

If the value of returns exceed the cost of inputs the enterprise shows a **profit**.

If the value of returns is less than the cost of inputs the enterprise shows a **loss**.



**\*NOTE:** For purposes of this document the term “funds” represents all forms of “liquid resource” used as “media of exchange”. Cash is most commonly seen as a medium of exchange but there are others too. For example material resources (like raw materials), intellectual resources (like patented ideas) and relational resources (like knowing people key to enterprise success) may also serve as media of exchange.



## Attachment A: Seaplant value chain basics:

**KITS** are core enterprise resources

**Unique resources** include KITS that are kept totally in-house as “core competencies”. They are the basis for enterprise competitive advantage.

**Robust brands** are essential unique resources that attract transaction opportunities.

**The enterprise core**  
includes knowledge, attitudes &  
concepts that define how an  
enterprise will apply KITS to  
resource utilization in value chains.

**Resources reflect the tangible & intangible presence of an enterprise.**  
The structure and the brand identity of an enterprise reflect the ways in which enterprise values define how KITS are applied during resource utilization in value chains.

**Firm resources** include KITS that are used in day-to-day process operations. They can be "liquidated" for use as liquid resources.

**Liquid resources**  
can readily be used as media of exchange in transactions (e.g. money & finished products).

