**Appendix 1.** Statements for the evaluation of food system performance: economic performance, environmental protection, social welfare and food and nutrition security

|  |  |
| --- | --- |
| **Food system outcome / Statement** | |
| Economic performance | E1. The vegetable food system is economically profitable (overall)  E2. The economic benefits of the vegetable food system are fairly distributed among the actors that make up the system, taking into account the investments made and the risks assumed.  E3. The vegetable food system is productive in terms of outputs per unit of input  E4. The vegetable food system produces economic benefits for communities and regions  E5. The vegetable food system promotes efficient marketing channels |
| Environmental protection | M1. The vegetable food system minimizes the following negative impacts on the environment: greenhouse gas emissions, water pollution and soil depletion  M2. The vegetable food system reduces or eliminates the release of pesticides on the environment  M3. The vegetable food system preserves biodiversity in agro-ecosystems |
| Social welfare | S1. The vegetable food system provides significant opportunities for all the actors that are part of it  S2. The vegetable food system is inclusive. This refers to the fact that the system foster participatory forms of governance, and all system actors have equal access to resources, markets and information  S3. The vegetable food system actors have equal levels of autonomy and empowerment in decision-making  S4. The vegetable food system generates employment with fair working conditions  S5. The vegetable food system promotes transparent marketing channels in terms of information for all system actors and consumers  S6. The vegetable food system encourages consumers to know where, how and who produces their vegetables |
| Food and nutrition security | FS1. The vegetable food system produces a sufficient and permanent amount of vegetables to meet the national demand  FS2. The vegetable food system provides vegetables whose prices are accessible to all consumers in Chile, regardless of their socio-economic level  FS3. The vegetable food system provides vegetables that can be purchased everywhere in Chile  FS4. The vegetable food system has mechanisms of control in the use and handling of pesticides in production and distribution of vegetables in such a way that health risks to consumers are eliminated or reduced |

**Appendix 2.** Interviews, validation of results, questionnaires and self-placement of actors based on the food system component.

|  |  |  |
| --- | --- | --- |
| **Food system component** | **Institution/Activity** | **Activity** |
| Agricultural production system | Organic large scale producer | Interview |
| Medium organic producer | Interview |
| Agroecological community | Interview |
| Regional horticultural program | Interview |
| Agroecological producer 2 | Interview |
| Association ecological producers | Interview |
| Large conventional producer | Interview / questionnaire |
| Agroecological producer 1 | Interview / questionnaire |
| Community-supported agriculture | Interview / questionnaire |
| Large conventional producer | Validation / questionnaire |
| Large conventional producer | Questionnaire |
| Large conventional producer | Questionnaire |
| Value chain | Street markets (ASOF) | Interview |
| Eco-fair 1 | Interview |
| Eco-fair 2 | Interview |
| Eco-shop | Interview |
| Intermediary / distributor 1 | Interview |
| AFIPA | Interview |
| Intermediary / distributor 2 | Interview / questionnaire |
| Wholesale market Lo Valledor | Interview / validation / questionnaire |
| Support structures for innovation and everyday functioning of agricultural production systems and value chains | Extension services |  |
| INIA – organic transfer group | Interview |
| Public advisor 1 PRODESAL | Interview / questionnaire |
| Public advisor 2 PRODESAL | Validation / questionnaire |
| Public advisor 3 PRODESAL | Validation / questionnaire |
| Public advisor 4 PRODESAL | Validation / questionnaire |
| Public advisor 5 PRODESAL | Questionnaire |
| Public advisor 6 PRODESAL | Questionnaire |
| Extension horticultural program University Chile 1 | Validation / questionnaire |
| Extension horticultural program University Chile 2 | Validation / questionnaire |
| Public advisor municipality | Validation / questionnaire |
| Private advisor 1 | Validation / questionnaire |
| Private advisor 2 | Validation / questionnaire |
| Private advisor 3 | Interview / validation / questionnaire |
| Private advisor and researcher University of Valparaíso 1 | Validation / questionnaire |
| Private advisor and researcher University of Valparaíso 2 | Validation / questionnaire |
| Regional centre technical extension | Validation / questionnaire |
| Research |  |
| Researcher University of Chile 1 (Postharvest) | Interview |
| Researcher University of Chile 2 | Validation / questionnaire |
| Researcher University of Valparaiso | Interview |
| Researcher USACH 1 | Validation / questionnaire |
| Researcher USACH 1 | Validation / questionnaire |
| Ministry of Agriculture |  |
| ACHIPIA | Interview |
| FIA | Interview |
| SAG organic agriculture / certification | Interview |
| SAG organic agriculture / inputs | Interview |
| INDAP sustainability program | Interview / questionnaire |
| INDAP commercialization program | Interview / validation / questionnaire |
| ODEPA organic agriculture | Interview / questionnaire |
| ODEPA sustainability | Validation / questionnaire |
| Ministry of Economy and Development |  |
| CORFO | Interview |
| Innova Chile | Interview |
| ProChile | Interview |
| Sustainability and Climate Change Agency | Interview / validation / questionnaire |

ASOF - National Trade Union Confederation of Street Markets, AFIPA - association of manufacturers and importers of phytosanitary products, PRODESAL - Program of Local development, INDAP - Institute for Agricultural Development, ODEPA - Office of Agricultural Studies and Policies, FIA - Foundation for Agricultural Innovation, ACHIPIA - Chilean Agency for Food Safety, SAG - Agricultural and Livestock Service, INIA - Agricultural Research Institute, CORFO - Corporation for the Promotion of Production, ProChile - Chile’s Export Promotion Agency.

**Appendix 3.** Detailed characteristics of vegetable food system types in Chile

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Characteristics | Small conventional / traditional system  **(Type I)** | Small, agroecological system  **(Type II)** | | Small, organic system  **(Type III)** | | Large, organic system  **(Type IV)** | | Large, conventional system  **(Type V)** | |
| Agricultural production system | | |  | |  | |  | |  |
| 1. Area | < 12 ha HRB | | less than 12 ha HRB | | less than 15 ha | | more than 15 | | more than 12 ha HRB |
| 1. Labor | Mainly family labour with occasional hired labour | | Mainly family labour with occasional hired labour | | Family labour and commonly hired labour | | Hired labour | | Mainly hired labour |
| 1. Level of EI / agronomic management | Low to medium level of EI / conventional management + traditional farming practices | | Medium to very high level of EI / agroecological management with occasional use of conventional inputs | | Medium to very high level of EI / mostly agroecological management with use of commercial organic inputs | | Low to medium level of EI / mostly input-substitution systems | | Very low to low level of EI / conventional management |
| 1. Tax compliance | Very low –high | | Very low –high | | High – very high | | Very high | | Medium – very high |
| 1. Management level | Very low - medium | | Very low - medium | | Low - high | | High – very high | | Medium – very high |
| 1. Production orientation | Auto-consumption and market | | Auto-consumption and market | | Market and to a lower extent auto-consumption | | Market | | Market |
| **Value chain** |  | |  | |  | |  | |  |
| 1. Network structure |  | |  | |  | |  | |  |
| a1. Vertical relationships | Limited collaboration in traditional channel. Food Corporation Market Observatory (CODEMA) | | Limited collaboration in traditional channel. Moderate to strong collaboration in some short marketing channels (Farmers – consumer organizations and agroecological communities –/organized consumers) | | Moderate to strong collaboration in short marketing channels (e.g. association of ecological producers – eco-fairs and association of ecological producers – individual or consumer organizations) | | Moderate to very high coordination between producers and supermarkets (logistics, volumes, standards, control mechanisms, price setting, sanctions) | | Limited collaboration in traditional channel  Moderate to very high coordination producers – agroindustry or supermarkets ((logistics, volumes, standards, control mechanisms, price setting, sanctions). Contract farming producers and agroindustry |
| a2. Horizontal relationships | Limited collaboration in traditional channel (e.g. groups of farmers in PRODESAL, ASOF) | | Limited collaboration in traditional channel (see Type I) / Moderate to strong collaboration in short marketing channels (e.g. agroecological communities, groups of farmers in PRODESAL, consumer organizations | | Moderate to strong collaboration in short marketing channels (e.g. association of ecological producers, organization of street fairs, organization of consumers, marketing cooperatives) | | Lack or very low collaboration | | Limited collaboration in traditional channel (e.g. ASOF) / Very low collaboration in modern channels (supermarkets and agroindustry) |
| 1. Value chain governance |  | |  | |  | |  | |  |
| b1. Bilateral contracts |  | |  | |  | |  | |  |
| b11. Type of agreements | Spot market and informal agreements. Long-term informal relations may also exist | | Spot market and informal agreements in traditional channel and short marketing channels | | Spot market and informal agreements in short marketing channels | | Written commercial agreements with retail / Spot market and informal agreements with small retailers and producers Type III | | Spot market and informal agreements in traditional channel / Written commercial agreements with retail / Spot market and seasonal contracts (contract-farming) with agroindustry (ODEPA 2018a) |
| b12. Price | Mostly spot price in traditional channel. In some cases intermediaries set arbitrary prices | | Spot price without bonus in traditional channel (see Type I) / price agree between actors with reference the market price in short marketing channels / fixed price in box-schemes) | | Price agree between actors in short marketing channels (e.g. producers and marketing cooperatives/eco-shops) / spot price for organic products used as reference price in eco-fairs/markets/direct sales / fixed price in box schemes | | Weekly/monthly/annual fixed price with supermarkets + bonus / spot price or based on verbal agreements + bonus with small retailers | | Spot price in traditional channel (see Type I) / Weekly/monthly/annual fixed price with supermarkets and agroindustry |
| b13. Volume | Spot volume or based on informal agreements in traditional channel | | Spot volume or agreed on informal agreements in the traditional channel / spot volume or variable based on informal agreements in short marketing channels | | Spot volume or variable and based on informal agreements in short marketing channels | | Volume and frequency fixed in written agreements with supermarkets / spot volume with producers and small retailers or variable and based on informal agreements | | Spot volume or agreed on informal agreements in traditional channel / Volume and frequency fixed in the written agreements with supermarkets and agroindustry. |
| b14. Safety | Almost non-existent standards and requirements and lack of traceability systems in traditional channel | | Limited standards and requirements on safety and lack of traceability in traditional channel / social control in short marketing channels based on relations of trust | | Compliance with the technical regulations in organic production and internal control systems (PGS) / internal control systems in eco-fairs/markets | | Compliance with the technical regulations in organic production. Audits of third party certification body / Supermarket audits although mainly focus on phytosanitary standards | | Lack of control and traceability in traditional channel / Moderate to high standards on safety with supermarkets - Audits by supermarket and the agroindustry, mostly focused on phytosanitary standards. High traceability. |
| b15. Quality | Spot market requirements in traditional channel (based on size, colour, firmness and postharvest shelf-life) | | Spot market requirements in traditional channel (see Type I) / Attributes of health, local production, food security and sustainability in short marketing channels | | Organic label and attributes on health, local production, food security and sustainability | | Organic label and health, and supermarket requirements on quality (size, colour, firmness, texture, freshness, postharvest shelf-life) | | Spot market requirements in traditional channel (see Type I) / Buyer requirements on quality (size, colour, firmness, texture, freshness, postharvest shelf-life) |
| 1. Network governance |  | |  | |  | |  | |  |
| c1. Leadership | No clear leadership in traditional channel | | No clear leadership in traditional channel / Leadership by agroecological communities or organization of consumers in short marketing channels | | Leadership by associations of organic producers | | Leadership taken by supermarkets | | No clear leadership in traditional channel / leadership taken by supermarkets and agroindustry |
| c2.Shared governance | Very low or no existent communication and consultation throughout the chain | | Limited communication and consultation throughout the chain in traditional channel / participation and autonomy in agroecological groups and communities and organization of consumers | | Horizontal participation and autonomy in the organizations of organic producers, cooperatives and eco-fairs. Frequent assemblies and meetings | | Limited communication and relationships are mainly commercial | | Very low communication and consultation in traditional channel / Communication and relations with supermarkets and agroindustry are mainly commercial |
| 1. Informal mechanisms |  | |  | |  | |  | |  |
| d. Trust | Very low or lack of trust between actors in traditional channel, although there are long-term relationships between suppliers and buyers | | very low trust between actors in traditional channel/ Medium to high trust between value chain actors in short marketing channels. Free riders may lower the trust | | Relatively high levels of trust between value chain actors. Free riders may lower the trust | | Low to moderate levels of trust between supplier and buyers. | | Very low trust between actors in traditional channel / low to moderate levels of trust between supplier and supermarkets and agroindustry |
| **Support structures for innovation and everyday functioning** | | | | | | |  | |  |
| R & D | Formal education centres and public research centres (e.g. INIA). Research in vegetable production and commercialization for the peasant family agriculture is limited | | NGOs, alternative research centres and grassroots networks and social movements (learning by doing). Alternative centres provide in some cases a scientific basis to agroecology enriching the experiences in the field.  Formal education centres (marginal – there are not undergraduate degrees or specializations in agroecology. However at least five universities present research and extension groups in agroecology (Montalba et al., 2017)  Public programs and research in agroecology or organic agriculture (marginal but there are initiatives in INIA, INDAP and CONADI) (Montalba et al., 2017) | | NGOs, alternative research centres and grassroots networks and social movements (learning by doing. Alternative centres provide in some cases a scientific basis to agroecology enriching the experiences in the field  Formal education centres (marginal – there are not undergraduate degrees or specializations in agroecology. However at least five universities present research and extension groups in agroecology (Montalba et al., 2017)  Public programs and research in agroecology or organic agriculture (marginal but there are initiatives in INIA, INDAP and CONADI) (Montalba et al., 2017) | | Private research centres and learning by doing. R&D in formal education centres and public research centres is marginal. | | Formal education centres and public research centres (INIA)  Post-harvest technologies, productivity, competitiveness, value-added |
| Extension services | Extension financed by public institutions and delivered by private advisors, academic and civil society institutions.  Technical advice through INIA and input supplying companies (e.g. AFIPA).  Pesticides: extension focuses on management and disposal of pesticides, GAP and CP agreements | | Grassroots knowledge sharing systems, NGOs, and alternative research centres. Extension financed by INDAP and delivered by private advisors, academic and civil society institutions.  Public extension in agroecology is marginal | | Grassroots knowledge sharing systems, NGOs, alternative research centres. Public extension in organic agriculture is marginal | | Private extension with a demand- driven approach and input sellers providing technical advice | | Private extension with a demand- driven approach and technical advice by input supplying companies (e.g. AFIPA) Pesticides: extension focuses on pesticide efficiency via technological innovation, GAP and CP |
| Innovation policy | Public policies, programs and funding through INDAP. | | Innovation comes from grassroots networks and social movements  Limited public policies, programs and innovation in agroecology and commercialization.  Integration of concepts of agroecology and organic agriculture in public funding (especially through FIA and the Ministry of the Environment (Montalba et al., 2017). However, efforts are marginal. | | Law in organic production / Innovation comes from grassroots networks and social movements.  Limited public policies, programs and innovation in agroecology and commercialization.  Integration of concepts of agroecology and organic agriculture in public funding (especially through FIA and the Ministry of the Environment (Montalba et al., 2017). However, efforts are marginal. | | Law in organic production. Public innovation agencies and development programs (FIA, CORFO, etc.) but are not specific for the vegetable sector and for organic production and commercialization  Integration of concepts in organic agriculture in competitive public funding (especially through FIA and the Ministry of the Environment (Montalba et al., 2017). However, efforts are marginal. | | Existence of public innovation agencies and development programs (e.g. FIA and CORFO) but not specific for the vegetable sector  High Technology Program” of Innova Chile to support the development of high-tech projects with significant commercial potential. Technological innovation |

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**Appendix 4.** Expert assessment of current food systems performance

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Food system performance / statement | (Type I) | (Type II) | (Type III) | (Type IV) | (Type V) |
| E1 | 2.5 | 3.0 | 3.5 | 4.4 | 4.4 |
| E2 | 2.0 | 3.5 | 3.7 | 3.2 | 3.1 |
| E3 | 2.8 | 3.2 | 3.3 | 4.0 | 4.5 |
| E4 | 2.8 | 3.5 | 3.5 | 3.5 | 3.4 |
| E5 | 1.7 | 3.1 | 3.6 | 3.6 | 3.7 |
| **Average E** | **2.4** | **3.3** | **3.5** | **3.7** | **3.8** |
| M1 | 2.1 | 4.2 | 4.2 | 3.5 | 1.9 |
| M2 | 1.7 | 4.5 | 4.7 | 4.2 | 1.9 |
| M3 | 1.9 | 4.3 | 4.2 | 3.2 | 1.7 |
| **Average M** | **1.9** | **4.3** | **4.4** | **3.6** | **1.8** |
| S1 | 2.6 | **3.7** | 3.7 | 3.4 | 3.3 |
| S2 | 1.9 | 3.3 | **3.8** | **2.8** | **2.8** |
| S3 | 2.0 | 3.5 | 3.6 | 3.0 | 3.1 |
| S4 | 2.0 | 3.5 | 3.6 | 3.3 | 3.1 |
| S5 | 1.5 | 3.3 | 3.6 | 3.5 | 2.9 |
| S6 | 2.0 | 3.9 | 4.2 | 3.7 | 2.2 |
| **Average S** | **2.0** | **3.5** | **3.7** | **3.3** | **2.9** |
| FS1 | 2.7 | 2.3 | 2.4 | 3.1 | 4.3 |
| FS2 | 4.2 | 3.3 | 2.6 | 1.9 | 3.8 |
| FS3 | 3.2 | 2.1 | 2.0 | 2.5 | 4.3 |
| FS4 | 1.3 | 3.5 | 4.2 | 4.5 | 3.1 |
| **Average FS** | **2.9** | **2.8** | **2.8** | **3.0** | **3.9** |
| **Overall performance** | **2.3** | **3.5** | **3.6** | **3.4** | **3.0** |

Performance scores on the basis of a five-point Likert scale, where 0 represented a strongly negative performance of the system type in relation to a given statement, and 5 a strongly positive performance. *Type I*: Small, conventional/traditional system; *Type II*: Small, agroecological system; *Type III*: Small, organic system; *Type IV*: Large, organic system; *Type V*: Large, conventional system. *Food system goals. E:* Economic performance*; M: Environmental protection; S:* Social welfare,and *FS*: food and nutrition security. Detailed information about the statements for each food system goal can be found in Appendix 1.