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Coordination SUD
Solidarité Urgence Développement

Economic efficiency and effectiveness of agricultural water use in family farming

1. The need for an economic approach to the use of agricultural water

Since 2011, the "Agricultural Water" work group (AVSF, Gret, Agter[1]) of the Agriculture and Food Commission (C2A, Commission Agriculture et Alimentation) of Coordination SUD has been working to develop and disseminate advocacy in support of water access for family farming in the South[2]. Through its participation and speeches in various forums (FAME and FME[3] in Marseille, 2012, Water Week in Stockholm, 2012, Convergences, etc.), it has been able to put the theme of "agricultural water and family farming" on the international agenda.

The group has put a stop to common misconceptions, stressing that **not all peasants waste water!** On the contrary, peasant farming around the world involves traditional collective and individual know-how with a proven track record in terms of the sustainable management of water for the benefit of the community. This knowledge and these practices ought to be recognized and promoted, in the face of the capital-intensive and often water-intensive farming model that dominates debates and influences policy.

The group has also emphasized that water is **a common good that must first and foremost serve the general interest,** and which cannot be shared solely on the basis of the laws of the market. Water is a vital good and peasant farming in the South is highly dependent on it for food production: rain-fed crops, irrigated crops, water for livestock and halieutic resources. With intensified competition for the resource, more and more peasants are being stripped of their age-old rights to water, whereas they rely on it. Yet family farming has immense potential to meet food security, social justice and environmental sustainability challenges. Peasant farmers'right to access water must therefore be guaranteed.

As current solutions are all too often standardized, Coordination Sud has proposed three priorities:

1. Investing smartly in agricultural water for family farming: supporting the dissemination of simple water management farming practices and techniques; investing in the construction and rehabilitation of irrigation infrastructure that is suited to local management capacities and recognizes existing know-how; strengthening the competencies of local management institutions (water user associations, service centres for irrigators, etc.).

2. Protecting water (access and use) rights for farming: supporting all rural development policies encouraging the recognition and securing of the full range of water rights.

3. Encouraging collaborative and democratic water management: promoting the creation of forums for dialogue for the fair distribution of water between users, industries, cities and rural areas, with the close involvement of peasant organizations.

While these proposals have been partly heard, the fact nevertheless remains that securing peasant water access is still of minor interest in debates, despite the recognized challenges surrounding food, the environment, climate issues, rural employment and poverty alleviation. **The question of the economic efficiency of water use is often raised** in all international arenas, with some industries readily questioning water usage in peasant farming compared to other modes of farming.

To answer these questions, in 2013 the "Agricultural Water" group of the C2A carried out a literature review of existing studies (by research bodies, NGOs, technical institutes and international organizations) relating to the efficiency and effectiveness of peasant water use[4]. A seminar was organized in September 2014 for professionals and representatives of user organizations to discuss and debate these economic analyses – often incomplete and with widely diverse methods – on the impact of securing water for peasant farming.

2. How can the economic effectiveness of agricultural water use be assessed ?

Agricultural water is not an object whose use can easily be quantified in economic terms, as **water has particular characteristics** which are important to remember.

Water is naturally a vital ingredient for life, and particularly for farming. It exists in a gaseous, liquid and solid state. While we are only concerned with fresh water here, it is part of various inter-related cycles of differing dimensions, some of which involve sea water, the main water reservoir on earth. Unlike land, in the sense of a share of the earth's crust, water is therefore not confined to a fixed space. It can be accessed through the various precipitations, but also by drawing from flows or reserves with differing replenishment rhythms.

Water usage analyses usually distinguish between "blue" water, which can be drawn from rivers, lakes and groundwater, and "green" water, found in the soil and available for plant growth. But there is also "white" water (water set in solid form in ice caps, glaciers and eternal snow), "grey" water (used water without faecal waste) and "black" water (water containing faecal waste). In farming, water can be stored in crops or animal production, evaporate, or return to cycles in liquid form, but often after change of nature, sometimes becoming unfit for certain uses. The impacts of water use directly affect populations that may be far removed from the place where the water is taken. These impacts can even sometimes be transboundary, rendering their governance even more complex.

Humans'relations with water, even more so than their relations with land, are therefore also relations between humans themselves, concerning the appropriation and use of this resource. It is the only common good which has the particular characteristic of being a necessarily shared flow, from the source all the way downstream. Upstream users therefore have a responsibility towards downstream users. This point also applies to fresh groundwater which, like surface water, flows by gravity, but over longer periods. Moreover, while fresh water is a natural resource which can easily be shared, divvying up flows and/or sharing stocks can lead to changes in water cycles and cause a deterioration of water quality. Water is therefore a good whose shared management by humans is vital : this has been so since the dawn of time, with collectively negotiated, often complex rules, difficult to establish between users with often divergent interests and ultimately changing according to the social, economic, demographic and environmental context. Most of the time, attempts to appropriate and use water resources individually without regard for others produce negative impacts, starting with conflict. It is therefore crucial to take into account the different spatial entities (the plot, the territory, the region, the catchment area, inter-basin areas, etc.) and timeframes (day, season, year, long period), as the scales on which water cycles develop vary widely. Climate change and changes in water cycles illustrate this well.

Finally, water as a resource is not originally the product of human work. Access to water can of course be facilitated largely by various types of hydraulic construction, but there is always a share of the water resource that comes from nature. The appropriation of this natural resource is a growing challenge, as the resource is becoming increasingly rare and competitive.

In these conditions, assessing the economic effectiveness of agricultural water use is no easy task. In fact, there is an abundance of misleading discourse justifying practices in the interests of a few powerful industries. Some base their analyses solely on the productivity of water, considering water as an "input", and therefore purely as an economic resource, and thereby overlooking the fact that water is first and foremost a common good.

Others use the concept of "virtual water", in other words the quantity of water needed to produce goods in one country for export and consumption in another country, sometimes without regard for the impacts these exports and this international trade may have both on food security in the producing countries, and on the environmental sustainability of farming models and the renewal of water resources. In many cases, the exploitation of local water resources under the pretext of lower consumption in volume does not prove sustainable, as demonstrated by pineapple crops on the Golan Heights, tomato crops on the Moroccan plains, fruit and vegetable crops in the South of Spain, etc., which are depleting groundwater resources.

These concepts, often poorly defined or misused, therefore seem inadequate to assess the economic effectiveness of agricultural water use, especially as it is important to **clearly distinguish the main water user's interests from those of their neighbours and of society as a whole.**

For the C2A "Agricultural Water" group of Coordination Sud, an objective analysis of the economic efficiency of agricultural water use must therefore study it from three complementary perspectives :

1. An analysis of the **value added created through farming** and not that of raw production.
2. An analysis of the **distribution of this value added created and of the impact on employment.**
3. Finally, to take into account the interests of society as a whole, an analysis **of the externalities and effects induced on the resource's availability for other users, environmental sustainability, the renewal of the resource, the creation or regulation of usage conflicts and conflicts between users,** etc.

3. Peasant farmers are by no means those who create the least value added

Debates on "productivity" are often distorted by the confusion between value added and production. This is particularly the case when it comes to the productivity of water. Value added is the difference between the total value of the goods produced and that of the goods and services consumed during the production cycle (including the equipment and facilities involved). Thinking in terms of yields (raw production) per hectare or per cubic metre of water used often means promoting the most productivist modes of production, even though they do not necessarily generate the most wealth or the most value added per ha or m3 of water.

Note that this reasoning involves being able to estimate the value of the different goods, of the inputs and of the production, as well as the cost of remedying negative impacts. This value is far from always being reflected in prices. There can be significant distortions along supply chains and in subsidies, and completely uncompetitive markets with highly unequal power dynamics between the different actors.

Existing analyses on the comparative effectiveness of peasant farming when it has access to water, in terms of value added, prove that it has no reason to be considered inferior, as in many cases it performs much better than large farms or agro-industrial companies !

Peasant irrigation in the Equatorial Andes (AVSF). Undeniable economic performances afforded by the rehabilitation of a traditional irrigation system and strengthening of the irrigator association's management and maintenance capacities

In alliance with the IRD, in 1994 AVSF (CICDA at the time) initiated cooperation for the "rehabilitation of the traditional irrigated systems of Urcuquí and San Blas", at an altitude of 2,300 to 2,800 m on the foothills of the Piñan massif in the north of the Equatorial Andes. The iniquity of water access rights between Caciques rights (held by the descendants of the 1582 founder of the canal) and common rights had led to a distribution between the 453 users that was not only socially challenged, but especially unsuited to the needs of the crops. At the time the farming system was growing fast and was highly integrated into the market: maize for national consumption, beans for the very close Columbian market, and some fruit for the regional market.

During the first four years of the project, the physical rehabilitation of some of the infrastructure, in conjunction with the definition of new rules for water sharing and distribution between users, secured access to water and a regular service. The 435 peasant users secured their maize and bean crops in annual double cropping. Thanks to specialized technical assistance and access to credit over the following six years, they introduced new crops with high value added: tamarillos, avocados, and peppers.

Peasant irrigation on the coast of Peru (AGTER)

On the north coast of Peru, in the Piura region, the comparison of economic efficiency between a large sugar cane farm producing cane ethanol (an average 7,000 hectares) and small family farms (between 0.5 and 10 hectares farmed) offers a wealth of insight. Due to the very dry climate, all farming in this region is based on the command of irrigation. The State has actually supported the development of large irrigation projects designed to drive back the limits of the desert areas.

In the Chira River valley, 95% of farms are family farms on surface areas under 10 ha, and cultivate rice, bananas and lemons. **While large agro-industrial irrigated sugar cane farms generate significant value added across their total surface areas, this value is small when considered per hectare.**

Farm and crop types	*Gross profit (soles/ha)*	*Value added (soles/ha)*
Large sugar cane and ethanol (7,000 ha)		
Agroindustrial	28 427	11 869
Agricultural	11 518	115
Small farmers (0.5 to 10 ha)		
Sugar cane under contract	12 420	9 746
Organic bananas	26 964	23 739
Lemons	13 128	11 768

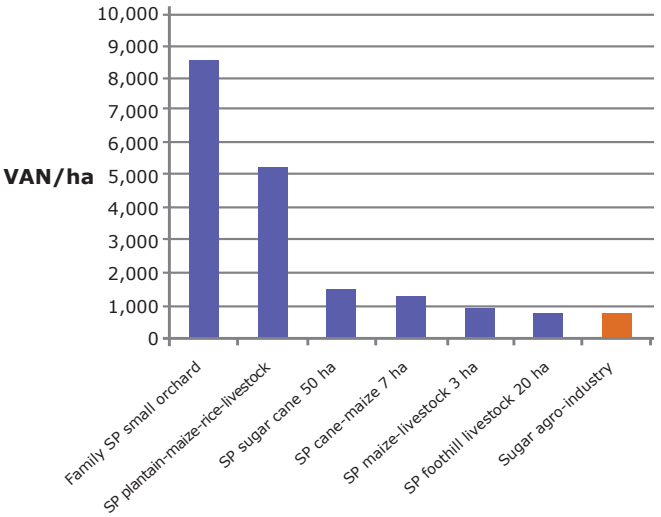
(Roy Averill. 2013. AGTER)[5]
Modelling based on data obtained on the companies Maple and Caña Brava and surveys of the banana farmers in the Huangalá area and lemon farmers in the Cieneguillo area, as well as studies carried out on sugar cane farmers under contract with the company Caña Brava.

With an average 0,75 ha irrigated per beneficiary, the net value of additional production is estimated at US$ 1,200 per year for each beneficiary family. With 435 beneficiaries, this represents €390,000 generated annually, or €3.9 million value added created in 10 years. The total investment made over this same period (1994-2004) is estimated at €760,000. The estimated **share of wealth generated in 10 years is therefore more than five times greater than the initial investment!**

(Apollin F., Sexton D., AVSF, 2012[6])

Large-scale farming and irrigated family farming in Nicaragua (AGTER)

The Sandinista land reform (1981) in Nicaragua expropriated the land of some owners and redistributed part of the land. Since the 1990s, public policies have allowed for the development of private large-scale farming units. In Chinandega, in the north-west of the country, the sugar agro-industry is booming, covering over 27,000 ha, a third of which is irrigated. Yet in this region, where land remains a limiting factor for many small farmers, **these large companies generate far less wealth per hectare than do family systems**, as shown by the diagram below.



(Jahel Camille, AGTER 2013)[7].

Peasant irrigation in the Prey Nup polders in Cambodia (GRET)

After over 20 years of war and instability, Cambodia has entered a phase of reconstruction : the physical reconstruction of infrastructure, the reconstruction of the State apparatus providing services to the population and regulation, and especially the reconstruction and modernization of its institutions. The project to rehabilitate the Prey Nup polders is part of this process, combining dike repair, the transfer of infrastructure management to users, the creation of financial security, and the provision of support for the farms'economic development. The Prey Nup project, the first experiment in transferring the management of facilities to a peasant organization in Cambodia, was completed in 2008. The Prey Nup polders cover 10,500 ha of rice fields. The project allowed for the reactivation of 3,000 ha and afforded higher yields across all the areas, through better control of water and agronomic action-research.

The increase in annual paddy production from 12,000 to 27,000 tons (+15,000 t) allowed for a **166 % farming income increase in 8 years, in other words over 20 % per year.** The reactivation of 2,700 ha uncultivated prior to the project benefited 1,950 of 10,000 families. With the land reactivation and the increase in agricultural production, the share of self-sufficient households and households with surplus production rose from 44 % before to 74 % after the project. 48 % of the families moved to higher socio-economic categories (from non-self-sufficient farmers to farmers with a surplus, or from rice growers with a surplus to farmers with a diversified economy). 53 % of households who did not change socio-economic category saw a rise in their income and capital. The project allowed for the emergence of a redistributive tenant farming market (leasing), enabling 30 % of the landless peasants to work farmland.

Extrapolating the income gains to the whole area, **the net increase in farming income is estimated at 1.5 to 1.8 million dollars/year.** Including technical assistance, the total cost of the project of 13 million dollars over nine years was therefore recouped after about seven years. This shows that polder rehabilitation is therefore a profitable public investment that is relevant to society.

(Lagandré D., Gret, 2014)[8].

Finally, whereas for a plant one litre of water from the sky may be the same as one litre of blue water, supplied by an irrigation system, in economic terms the costs are very different. Water supply requires a number of services, which are not free, but excess water evacuation can also require infrastructure and involve costs. It is furthermore crucial to take into account pollution phenomena caused by crop or livestock farming. These considerations lead to other central points of our approach.

4. Irrigated peasant farming: value added which remunerates workers more than owners of the capital

Even though some capitalist and productivist farming models, requiring intensive use of inputs (farming equipment, inputs, advice, etc.) would generate more wealth and therefore more value added than other models, it is also crucial **to consider the distribution of this wealth** and therefore the share left to peasant farmers. This analysis of the redistribution of the wealth created must be carried out on different farming models using water and must thereby allow for the comparison of different alternatives and options (e.g. agroholdings versus peasant/family farming).

In many countries, especially LDCs, peasant farming is still the main source of employment. While the development of industry and services is crucial, it will not be able to meet the challenge of future employment in the short and medium term alone (demographic growth, youth forced out of rural areas by land pressure, etc.). The profit margins afforded by regional or international migrations are increasingly limited. While urban growth certainly presents an opportunity (new markets), without structured access to basic services or decent employment it can also lead to growing exclusion or inequality in cities, with corollary risks of social instability, urban violence, etc.

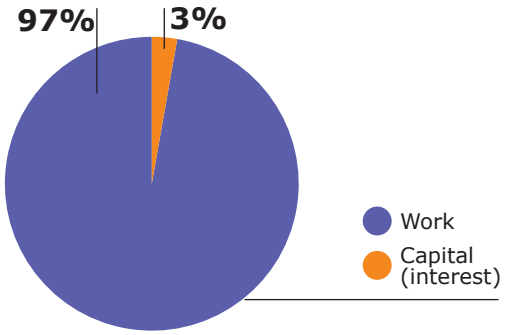
Some analyses show to what extent the value added created by water access for peasants (crop and livestock farmers, fishermen) allows for the maintenance and/or creation of decent employment in rural areas, including through its redistribution beyond peasant families alone. These studies merely confirm specific socio-economic approaches already followed within family or peasant farming units, with the co-existence of farming and the reproduction of labour. This fundamentally differs from the approach of a capitalist business, which primarily seeks return on investment.

Comparison of irrigation systems in Piura, Peru (AGTER)

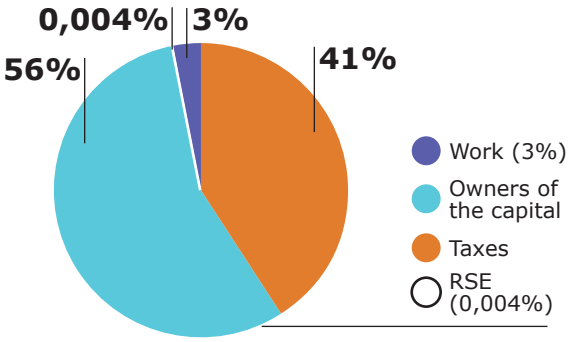
On the Peruvian coast in the Piura region, the value added created by agro-industrial companies is mainly used to remunerate shareholders and directors, and to pay interest to the banks financing the investments. Even though they often generate taxes, they first and foremost remunerate the owners of the capital, unlike small farms.

In terms of agricultural production, **large farms create virtually no employment:** in full-time equivalent, only one person is employed for every 46 hectares of plantation. For the same 46 ha surface, nearly 100 farming jobs are created by family farms.

DISTRIBUTION OF VALUE ADDED FOR SMALL FARMS



DISTRIBUTION OF VALUE ADDED ON LARGE FARMS PRODUCING ETHANOL



(Roy, AGTER, 2013)

5. Taking crucial induced effects into the economic analysis

If there is to be an economic analysis, it cannot be confined to solely measuring the farmer's creation of value added. It is equally necessary for the analysis to differentiate between the farmer and society as a whole.

The water drawn stems from intervention in a pre-existing cycle. It is therefore at least partially no longer available to other users. Conversely, water which seems lost through infiltration can serve other farmers and users downstream, who can thus benefit from replenished ground water. Polluted water can also have the effect of rendering much larger quantities of pre-existing water unusable.

These induced effects of course include economic impact through the redistribution of value added and the creation of direct and indirect rural employment, but also :

- The creation of local institutions and know-how for sustainable irrigation management, be it water distribution or maintenance,
- The resource's availability for other users upstream and downstream, including in urban areas,
- Environmental sustainability and the contribution to the flora and fauna through the return of the water to the environment,
- The renewal of the resource and replenishment of ground water,
- The reduction of rural exodus or of conflict between users in the areas concerned, etc.

Let us not forget that some of these effects can also be negative: air or water pollution and its impact on health (for example, in industrial farming, the effect of pesticides distributed by airplane on the health of the local population or on the soil), intensive and excessive pumping of groundwater, etc.

The irrigated system in Gal Oya - Sri Lanka Water as a factor of reconciliation between peoples

As water is a common resource to share and manage collectively and in a concerted manner across a catchment area, it can be a factor of dialogue between populations of a same area and bring them closer together. The case of the shared management of irrigation water in the Gal Oya area (Sri Lanka) in 1980-2000 offers a perfect example. Gal Oya is the largest irrigation reservoir in Sri Lanka, built in 1953. In 1981, the funder of the Gal Oya irrigation project granted 5% of the budget to the "soft": in order to better manage the water resource for irrigation, a user organization was created. It was the fruit of cooperation between members of two enemy ethnic groups, **the Tamil and the Sinhalese.**

The irrigator organization appealed to values of mutual help and human solidarity, and allowed the different irrigator associations not only to cooperate with one another, but also to impose solutions on the government, which managed the reservoir at the time. This project had a number of consequences, particularly: the theorization of concepts like mutually beneficial collective action and social capital; the government agreeing to discussions with the irrigators and drawing inspiration from this case to establish the Sri Lankan irrigation public policy; the management of serious drought crisis situations like in 1981 and 1997; positive economic results, including currency gains by no longer importing rice thanks to the increase in productivity in the area; and the long-term survival of the system, which was still in operation in 2014. Yet, was the most remarkable indirect result not the cooperation between Sinhalese irrigators upstream and poorer Tamil irrigators downstream, in the middle of a civil war? During those violent and troubled times, **the ethnic groups' collaboration to share water spared the Gal Oya region from violent conflict.**

(Uphoff N., Wijayaratna, 2014)

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In conclusion...

While the economic efficiency of agricultural water use is an important criterion to steer investment policies and programmes, or to prioritize certain types of use and users, the analysis and measurements carried out by both public and private actors until now have only partially taken into account all the above-mentioned elements: the value added created per ha and m^3 of water, the modalities of redistribution and jobs created, and the externalities generated, whether positive or negative. To do so, it is important to carry out analyses of land use systems taking collateral effects and the benefits and cost induced into account from the outset. Studies should not just consider the catchment area in which water is collected, but also the "extra-catchment" area in which the water is redistributed, as well as the adjacent coastal area. In other words, it is necessary to resituate the reality observed in the cycles of the water used.

It must be possible to use prices that correct most of the artificial effects produced by subsidies or by the existence of uncompetitive markets. An "economic" evaluation through the "effects method" or the "reference price" method will afford a better grasp of the interests of society as a whole, instead of only considering the interests of the farmer or the investor with a strictly financial analysis.

Finally, taking into account future generations and the long term will require analyses that cannot be based solely on quantitative evaluations. It is necessary to pursue our shared analysis to define long-term monitoring methods, criteria and indicators. In particular, exploring the different trends in farming societies, with the analysis of the main contradictions they will have to overcome, can help to move beyond a perspective that is too short-sighted.

In these conditions, the assumption that water can become a commodity like any other makes no sense. Nor is it a public good which everyone could access free of charge. It is at once a public good, a common good – sometimes common to several distinct communities –, and a private good. But it is thus not the same water at stake in each case, even though all these waters are essentially comprised of H_2O molecules. These are the differences that need to be highlighted in order to pursue and deepen the reflection surrounding the social justice in water issues and to understand when and how, economically speaking, access to agricultural water for small farmers is in the interests of humanity as a whole.

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[1] - The CCFD was one of the active members of this group until 2012

[2] - Under the aegis of Coordination Sud, the "Agricultural Water" work group produced several advocacy documents:
• Short formats: the C2A note "Guaranteeing Access to Water for Farmers", an official position note, a poster and a pamphlet "N'asséchons pas le potentiel des agricultures familiales! ("Don't Let Family Farming's Potential Dry Up!")
• A long report: "Fair Share of Water: Ensuring access to water for family farming in the South" available in three languages (French, English and Spanish).

[3] - The C2A "Agricultural Water" group of Coordination Sud steered the international consulting work and then the writing of a report with proposals and the organization of a final round table at the FME on target 229: Increase of Land & Water Productivity - Improve water management for more food production and increased access to water for smallholder farmers

[4] - Efficience économique de l'usage de l'eau agricole par les agricultures familiales, Remidi Belkacem, 2014, AGTER-AVSF-GRET-Coordination Sud – COSTEA.

[5] - La captation des ressources et des richesses par les investissements agricoles à grande échelle. Analyse Socio-comparée de différents secteurs de production dans la vallée du Chira, Roy Averill, 2013, AGTER, study funded by the Comité Technique Foncier et Développement.

[6] - Irrigation paysanne en Equateur: Consolider les performances économiques d'agricultures paysannes dans les Andes centrales d'Equateur, par la réhabilitation d'un système d'irrigation traditionnel et le renforcement de l'association d'irrigants, 2013, Apollin Frédéric, Sexton Danièle, AVSF, "Les expériences innovantes d'AVSF" collection: http://www.avsf.org/public/posts/1294/fiche_innovation_avsf_urcuqui_irrigation_expost_2012.pdf

[7] - Concentration des ressources et mutations du système agraire dans une zone historiquement agro-exportatrice du Nicaragua. Analyse diagnostic dans la région de Chinandega, Jahel Camille, September 2013. Study carried out for AGTER, with the support of the Comité Technique Foncier et Développement.

[8] - Réhabilitation des polders, croissance agricole et inégalités. L'impact socio-économique du projet Prey Nup (Cambodge): document de synthèse, Lagandré Damine, Lavigne-Delville Philippe, Gret, 2007.

Created in 1964, Coordination SUD (Solidarity– Relief–Development) is the national umbrella organization for more than 150 French development and relief NGOs. It has set up several working groups as part of its role in supporting its members' advocacy campaigns. One of these working groups is the Agriculture and Food Commission (C2A), which brings together international solidarity NGOs working to establish the right to food and to increase support for family farming in policies that have an impact on world food security. The Commission's objective is to coordinate the work undertaken by its member organizations and to facilitate mutual consultation on their advocacy work with various stakeholders and international policy-makers. The members of the Commission agree on Coordination SUD's representation with a range of organizations (CONCORD– European confederation of NGOs, FAO, WTO, UNCTAD), and share information on current international issues. The Commission is mandated by Coordination SUD to formulate the positions taken by the group at key institutional meetings on the subject of food and agriculture.

Agriculture and Food Commission Contact :
Cécile Leuba, Peuples Solidaires.
Tel.: +33 (0)1 48 58 21 85
Email: c.leuba@peuples-solidaires.org

This document was written by :
Michel Merlet (AGTER),
Patricia Toelen (GRET),
Frédéric Apollin et Yves Richard (AVSF).

Translated from French by Nonta Libbrecht-Carey

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