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**Statistics on Private and Public investment in agriculture:
government expenditure, capital stocks and other FAOSTAT
datasets**

I. INTRODUCTION

Creating a pro-investment climate conducive to investment by private agents, in particular the farmers, to raise productivity levels and realise necessary structural changes for generating additional food supplies and the incomes necessary for access to food continues to be a principal policy challenge. Mobilizing resources and measuring the development impact of investment in agriculture is fundamental, but requires a comprehensive dataset that encompasses resources for agricultural investment from private or public and external or internal sources in an internationally comparable dataset that supports analysis of the related resource flows.¹ To address this, FAO Statistics Division is developing an Investment dataset comprised of four main elements (Capital Stocks, Government

¹ For a review of the magnitude, trends in, and data gaps pertaining to investment in agriculture, see ESA Working Paper No.11-19 Financial Resource Flows to Agriculture (<http://www.fao.org/docrep/015/an108e/an108e00.pdf>)

Expenditure on Agriculture and Rural Development, Official Development Assistance to Agriculture, and Foreign Direct Investment in Agriculture). A key feature of this initiative is the harmonization of FAO work with that of other international organizations that are compiling relevant datasets. The focus of this paper is a review of strengthened efforts by the FAO Statistics Division to monitor resource requirements for — and commitments to — agriculture at the global level.

WHY MONITOR INVESTMENT FLOWS TO AGRICULTURE?

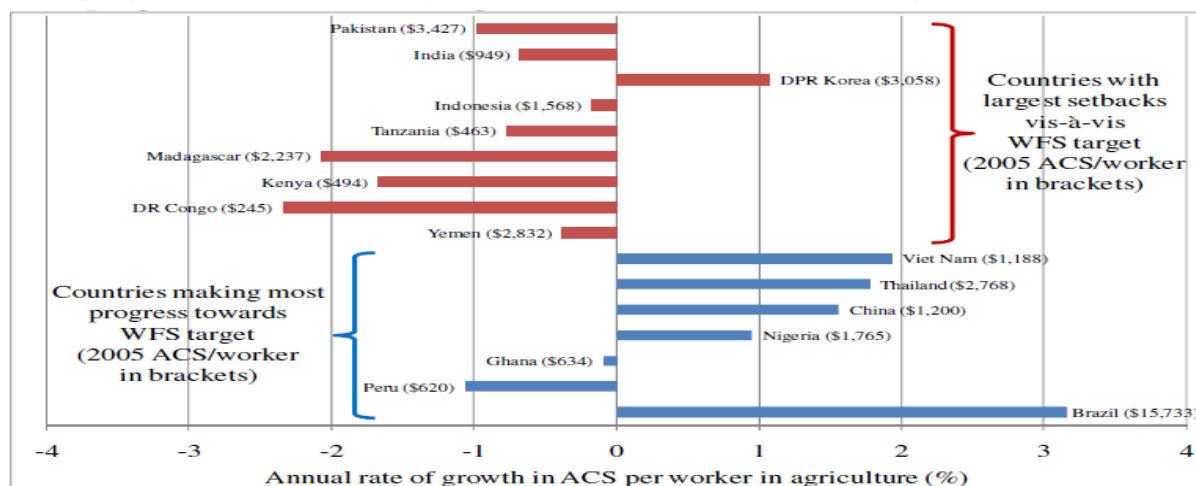
Rural households generate income from agricultural activities (revenues from the sale of agricultural products or employment in agriculture) and/or by employment in rural non-farm activities. However, owing to the ongoing financial crises there may be important adjustments underway in many countries in the form and levels of overall resource flows to agriculture; reduced access to credit, a generally shrinking public sector resource base, and new conditions of the international playing field may increasingly constrain the potential for investment in agriculture.

The 1996 World Food Summit (WFS) set the ambitious target of halving, no later than 2015, the number of hungry people. And, in 2001, FAO estimated that in order to achieve the WFS target the needed total gross investment in agriculture of the developing countries, including primary agriculture as well as storage, processing and support infrastructure, amounted to US\$ 180.4 billion annually for the period up to 2015. But have resource flows pertaining to the four main elements of investment in agriculture (Private Domestic Investment, Government Expenditure on Agriculture and Rural Development, Official Development Assistance to Agriculture, and Foreign Direct Investment in Agriculture) been adequate for meeting this global target over the intervening decade? The only way to answer this is by building reliable time-series data on each of these pillars for as many countries as feasible. FAO Statistics Division initiatives in this area is presented in the following sections.

A. AGRICULTURAL CAPITAL STOCK

Low capital stock per worker is reflected in low productivity per agricultural worker in agriculture, a defining characteristic of low-income countries. For agricultural labour productivity to grow, the amount of capital available for each worker (the capital-labour ratio) must grow. In many instances the gaps between high-income and low-income countries are widening as a result of low investment rates and/or growing labour forces in countries with low levels of agricultural capital per worker. As shown in Figure 1, there exists a strong

Figure 1: Annual rates of ACS growth (1990-2005) in countries that have made the most progress or suffered the largest setback towards the 1996 WFS target



Source: Von Cramon-Taubadel *et al.* (2009)

correlation between investment, i.e. capital accumulation, in agriculture and hunger reduction in developing countries. The graph shows that all countries with the largest setback vis-à-vis the WFS goal (except DPR Korea) have a negative annual growth rate in **Agricultural Capital Stock (ACS)** per worker in agriculture for the period 1990-2005, while, an opposite patterns is shown for the countries with the highest progress.²

In order to take into account the varying capital intensity and technology levels of the agricultural sectors in the different countries, data on capital stock per agricultural worker are essential. FAO has developed a comprehensive database on **ACS**, based on FAOSTAT's physical inventories. For the FAO approach to measuring ACS data, the concept of agriculture refers specifically to the activity of crop and animal husbandry for primary agriculture and includes the following components: land development, plantation crops, machinery and equipments, livestock, and structures for livestock. These data notably exclude the forestry and fishery subsectors as well as greenhouse production structures, mainly due to lack of information, which the Investment Dataset initiative will seek to address.

As a result, current global FAO ACS estimates (Annex II) may under represent actual capital intensity when compared with the other main Investment datasets which encompass agriculture, forestry, fishing and hunting activities. FAO Statistics Division staff are investigating the availability and relevance of existing series maintained by the Forestry and the Fisheries and Aquaculture Departments that could support establishing linkages with the other data sets as highlighted in Annex I and discussed — with reference to only the agriculture component for Indonesia in 2007 — in Section E, Data Compilation.

FAO ACS data are constructed using several sources of information and their quality is only as good as the underlying data.³ FAO Statistics Division is therefore undertaking several additional actions to improve the quality of ACS data. The most important are:

- A revised and more detailed questionnaire on Agricultural Machinery and Equipment based on HS 2012 has been sent to countries.
- Extending, when possible, the use of national accounts data in the estimation of fixed capital.⁴
- Use, in future, of the Cost of Production questionnaire being implemented by FAO for improving the input data.
- Improve the estimation methodology for the present value of future revenues from permanent crops.

² International data on Private Domestic Investment (PDI) are not available. Therefore, the Agricultural Capital Stock data are crucial to estimate PDI as a residual after accounting for government and foreign investment flows (including both ODA and FDI).

³ In Annex II we show the evolution of gross capital stock in the various regions from 1975 to 2007 and the differences between developing and developed countries in the composition of capital stock

⁴ Another approach to measuring ACS is based on national accounts (see: Larson *et al.* (2000), Butzer *et al.* (2010) and Daidone & Anriquez (2011)). This approach, although based on a more reliable and consolidated data system, has a much lower coverage in terms of developing countries. Globally, the FAO approach covers approximately 200 countries while the approach based on national accounts covers 59 countries. However, the national accounts can still be useful for FAO in improving the existing data, especially on fixed capital.

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- Obtain country-level information on the price of arable and irrigated land.
 - Develop a methodology for obtaining the aging profile of machinery.

Another related area being investigated is the use of data on **credit extended to agriculture**, which is generally available through monetary and financial statistics, as a benchmark indicator of private sector (primarily domestic) investment activity. Agriculture investment oriented loans provided by the banking sector in the accounting period of reference should directly relate to the rate at which ACS is accumulated over time. The amount of credit extended may also be influenced by flows pertaining to Government Expenditure on Agriculture and Rural Development, Official Development Assistance to Agriculture, and Foreign Direct Investment in Agriculture, each of which are discussed below.

B. GOVERNMENT EXPENDITURES ON AGRICULTURE

Although most investments may be primarily mobilised by the farmers themselves, the public sector — general government units and public (financial and nonfinancial) corporations — has a critical role. The efficiency of these expenditures, whether measured in relation to agricultural GDP, to total government outlays, or the agricultural labour force, remains a key element of the overall policy mix. Well targeted expenditures can create a conducive environment for private investment (economic incentives) and can ensure sufficient availability of public goods (basic rural infrastructure and market openness). This is particularly important because the role of government in economic activity may be scaled down in some countries over the coming decade owing to structural and fiscal reforms

The share of **government expenditures on agriculture (GEA)** is not related in any simple way to the size of the agricultural sector, and depends *inter alia* on the overall importance given to economic functions in governments' budgets. By bringing together the data on agriculture's shares in GDP and overall government expenditure we can construct an "**agricultural orientation index**" which reflects the extent to which government expenditures on agriculture reflect (or not) the importance of agriculture in the overall economy. To construct the index, the share of agricultural expenditure in total government expenditure is divided by the share of agriculture in GDP. For these and other reasons, monitoring government outlays on agriculture and rural development remains important. Despite the clear need for comprehensive time series, data on government expenditures on agriculture and rural development remain scarce, making addressing key public policy issues a challenge.

To address the paucity of observations for developing and emerging market countries and to ensure comparable data that are aligned with international standards, the FAO Statistics Division in collaboration with the IMF Statistics Department has developed a questionnaire based on the *Government Finance Statistics Manual, 2001 (GFSM 2001)* methodology, in particular Table 7: Outlays by Function of Government from the IMF's annual questionnaire on fiscal statistics. FAO Statistics Division launched the questionnaire in 2012, designed to collect key data series for tracking the allocation of government expenditures to agriculture and rural development and related metadata, requesting a General Government (and its subsectors) time series for the period 2001 to 2011. These data will support better analysis of governments' policy toward agriculture, forestry, fisheries, and environmental protection. Annex I — with reference to only budget execution data for Indonesia in 2007 — presents the FAO GEA template and its potential for establishing linkages with the other Investment Datasets, as discussed in Section E, Data Compilation.

C. EXTERNAL FINANCIAL RESOURCES

Governments can often raise additional domestic resources through fiscal reforms, including reforms in the tax systems geared toward ensuring a friendly investment environment for both foreign and domestic private investors. However, a number of low-income, food deficit countries will still have to rely on external transfers and drawing on some measure of official finance resources to generate funds for agriculture.

Official Development Assistance to Agriculture (ODA-Agri) by the major bilateral and multilateral donors is an important complement to domestic resources. Among countries with the highest prevalence of undernourishment, external assistance to agriculture may account for much of gross domestic investment and government expenditures. Developing countries that are particularly in need ODA may particularly benefit when an increasing share is directed towards the agricultural sector and other related areas, in particular rural development and infrastructure, research, extension and training, and environmental protection. These flows could be either official or private — comprised of loans (financial transactions) and/or grants (concessional transfers) — and, over time, there can be dramatic change in the composition of these resources. Understanding the dynamics underlying the share of Agricultural and Rural Development (both the broad and the narrow definitions) in total ODA therefore requires a dataset that captures all contributions made by bilateral donors as well as multilateral assistance, where the share and geographic distribution of flows of concessional assistance in total commitments and disbursement for agriculture and the share of grants in total commitments may be compared/analysed.

The OECD Creditor Reporting System (CRS), which records ODA and Other Official Flows (OOF) at the project level, is currently the most comprehensive when considering the allocation of assistance to agriculture as well as other relevant sectors by recipient country and region. FAO Statistics Division, in consultation with OECD, is developing a comprehensive CRS-based dataset that supports analysis of the destination of these flows world-wide in order to show whether its distribution is aligned with need or concentrated in a small number of countries. The existing FAO database on External Assistance to Agriculture (EAA) includes all CRS donors and gathers information on some additional relevant multilateral donors using annual reports or official websites. The EAA classification system is more detailed than OECD CRS on some agricultural activities/purposes and it refers to both narrow and broad definitions of agriculture. The table below compares existing FAO and OECD CRS classifications, which are being adopted.

Table 1: Matching FAO and OECD CRS classifications

	EAA	CRS
Number of Purposes	126	37
Number of Groups	14	8
1 to 1 correspondence	18	
1 to M (FAO less detail)	0	
M to 1 (FAO more detail)	16	
Inconsistent	3	

Given that most of the donors report their aid activities to the OECD, FAO has decided to abandon its existing EEA classification and to adopt the CRS list of purposes. However, FAO will augment the

CRS data by continuing to collect and maintain data for the activities related to agriculture provided by non-CRS reporters included in the FAO broad definition of agriculture. Annex I — with reference to data for Indonesia in 2007 — presents the new FAO ODA template and its potential for establishing linkages with the other Investment Datasets, as discussed in Section E, Data Compilation.

D. FOREIGN DIRECT INVESTMENT RESOURCES

In the poorest countries, where financial markets are underdeveloped, external aid still accounts for much of gross domestic investment (and for government expenditures). In part, this may be attributed to imperfect information available to potential investors and the risks of longer-term investment being perceived as high, resulting in difficulties in attracting **Foreign Direct Investment in Agriculture (FDI-Agri)**. As a result, the allocation of FDI, particularly in primary agriculture and related secondary activities may not be distributed according to where needs arise or where opportunities exist. Nonetheless, a host of factors — spikes in food and fuel prices, a desire by countries dependent on food imports to secure food supplies in the face of uncertainty, and speculation on land and commodity price increases — has recently prompted a sharp increase in investment involving significant use of agricultural land, water, and forested areas in developing and transition countries. As such, FDI-Agri by private and public sector agents may become an increasingly important source of finance for agricultural development.

FAO, IFAD, the UNCTAD Secretariat and the World Bank Group have developed a set of Principles for Responsible Agricultural Investment that Respects Rights, Livelihoods and Resources.⁵ Agreement was also reached that a consultative approach be developed for monitoring that encompasses all countries from which investment initiatives are emanating and towards which such investments are directed. In this regard, FAO and UNCTAD are collaborating to strengthen the data on FDI-Agriculture. This will entail, inter alia, improving data that support analysis aimed at maximizing the economic value-added and job creation potential of agriculture arising from private sector investment in value chains. The need for tools to identify the development impact of policies is at the root of the indicator framework, and is particularly needed by policymakers in low-income countries to promote sustainable investment and development. To this end, FAO Statistics Division is elaborating a questionnaire that would disaggregate the sector/industry series currently collected by UNCTAD, and based on ISIC Revision 4, as indicated in Annex I (with reference to data for Indonesia in 2007). This disaggregation strengthens the potential for establishing linkages with the other Investment Datasets, as discussed in Section E, Data Compilation. To better inform the feasibility of such a questionnaire, which would be formally launched in early 2013, FAO Statistics Division has sent a survey to selected APCAS member countries requesting their views on the feasibility of providing the proposed data in time series format.

E. DATA COMPILATION

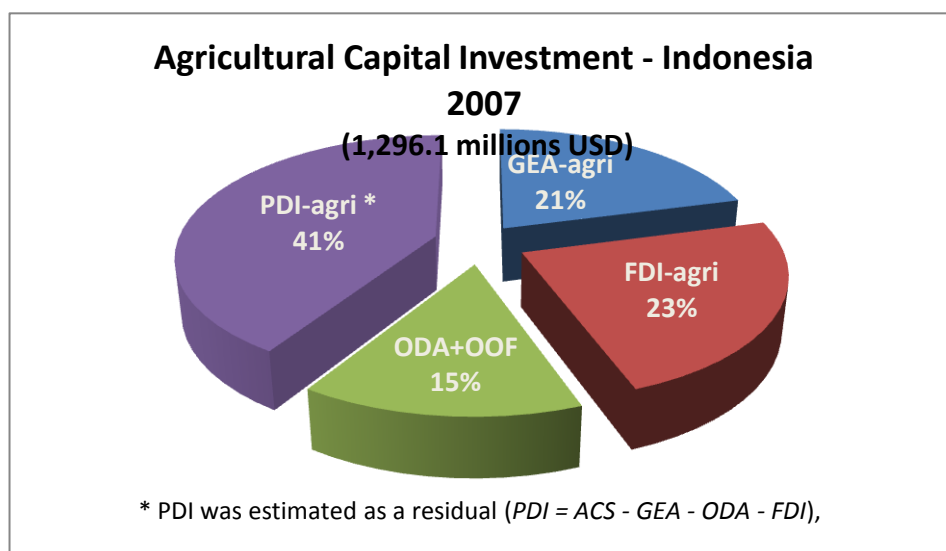
An example of preliminary work on collecting and combining the five datasets described above is illustrated in the Investment Dataset for Indonesia (2007) presented in Annex I. This example illustrates both the strengths and the challenges of obtaining a comprehensive and internationally comparable Investment dataset. In 2007, the FAOSTAT database would indicate that ACS (excluding

⁵ See <http://archive.unctad.org/Templates/Page.asp?intItemID=6123&lang=1>

forestry and fisheries), when measured in 2005 prices, increased in Indonesia by 1,294 million USD. This was achieved through a combination of agriculture investment oriented loans provided by the banking sector (516 million USD), a portion of the GEA for only agriculture (totalling 604 million USD, of which the capital component is estimated at 271 million USD)⁶, a portion of the ODA-Agri (totalling 189 million USD for the agriculture specific component), and a portion of the total amount (305 million USD) from FDI-Agri inflows. The total of the flows to agriculture from the five sources (1,280 million USD) closely approximates the FAOSTAT ACS derived flow, as shown in Figure 2 below. The example illustrates that if national authorities provide the desired disaggregation of agriculture, forestry, and fisheries data, including current and capital figures (or proxies) where relevant, a robust analysis of the dynamics of capital stock accumulation could be achieved for a majority of countries.

Going forward, FAO Statistics Division will work with countries to ensure that data needed to complete the Template in Annex I become available according the FAO broad definition of agriculture. In the short to medium-term, this will entail FAO staff compiling time series from data (and metadata) made available by national authorities on national websites (ministries of finance, central banks, and national statistical offices, among others). Modalities will need to be found for engaging in dialogue to address data gaps and ensure a timely flow of annual data series that support this initiative.

Figure 2. Components of Agricultural Investment Flows in Indonesia (2007)



CONCLUSIONS AND POINTS FOR DISCUSSION

Well channelled investment has individual and collective economic rewards as it enables the rural population to better contribute, in the short and long-term, to economic growth and the prosperity of

⁶ See Agriculture Public Spending and Growth in Indonesia, World Bank Policy Research Working Paper No. 5977, (http://www-wds.worldbank.org/servlet/WDSContentServer/WDSP/IB/2012/02/23/000158349_20120223091128/Rendered/PDF/WPS5977.pdf)

the national and global community. In this respect, the information and analyses supported by the evolving Investment Dataset may help to ensure that policies followed create favourable incentive environments supporting effective investment by farmers' and others.

APCAS participants are asked to express their views regarding the Investment Dataset initiative and FAO Statistics Division activities pertaining to:

- **ACS estimates disseminated on FAOSTAT** would be improved by the incorporation of data on private investment, where available, and data on capital stocks for forestry and fisheries, where relevant. Do participating countries compile such data? If so, how could these be provided to FAO Statistics Division?
- **Use of national website for data collection.** Experience with launching the GEA questionnaire has shown that in many countries relevant data series are publically disseminated. Should FAO compiled country-specific Investment Datasets be reviewed by the national authorities before being used for analysis by FAO staff and dissemination (for example, a new "*agricultural orientation index*") on FAOSTAT?
- **The availability of national guidelines pertaining to allocations of Official Development Assistance to Agriculture** in terms of recurrent (wages and salaries, use of goods and services, etc) and capital (acquisition of nonfinancial assets) purposes?
- **Committing to reporting detailed annual data** (or provide support in identifying the proper focal point) according to the prescribed breakdowns.

ANNEX I. Interrelationships among FAO Investment Datasets: Indonesia 2007					
FAO - ACS		millions USD	FAO - CRS		millions USD
	Agricultural Capital Stock			Official Flows for Agriculture (ODA+OOF)	2,461.5
	Agriculture (crops and animal husbandry)	1,294.1		AGRICULTURE, FORESTRY, FISHING, TOTAL	214.4
	Machinery and Equipment	20.6		AGRICULTURE	188.9
	Land Development	230.1		Agricultural policy and administrative management	4.8
	Livestock	986.6		Agricultural development	31.8
	Structures for Livestock	56.8		Agricultural land resources	0.2
	Plantation Crops	0.0		Agricultural water resources	117.0
	Forestry			Agricultural inputs	1.7
	Machinery and Equipment			Food crop production	0.9
	Forest reserves			Industrial crops/export crops	0.0
	Fisheries			Livestock	0.9
	Machinery and Equipment			Agrarian reform	0.0
	Acquaculture Development			Agricultural alternative development	0.0
	Fish stocks			Agricultural extension	0.0
	Hatcheries for fishstocks			Agricultural education/training	0.4
				Agricultural research	29.9
				Agricultural services	0.0
				Plant and post-harvest protection and pest control	0.3
				Agricultural financial services	0.0
				Agricultural co-operatives	0.0
				Livestock/veterinary services	1.0
				FORESTRY	15.0
				Forestry policy and administrative management	3.4
				Forestry development	11.1
				Fuelwood/charcoal	0.0
				Forestry education/training	0.0
				Forestry research	0.5
				Forestry services	0.0
				FISHING	10.4
				Fishing policy and administrative management	2.3
				Fishery development	6.9
				Fishery education/training	0.3
				Fishery research	0.7
				Fishery services	0.2
				Agriculture Related	132.7
				Agro-industries	0.0
				Forest industries	0.2
				General environmental protection	58.9
				Environmental policy and administrative management	12.6
				Biosphere protection	7.9
				Bio-diversity	2.1
				Site preservation	0.0
				Flood prevention/control	30.3
				Environmental education/ training	2.2
				Environmental research	3.9
				Other multisector	14.6
				Rural development	14.6
FAO - GEA	Government Expenditure on Agriculture	millions USD	FAO - Cr_Agri	Commercial Bank Credit to Agriculture	millions USD
	TOTAL OUTLAYS	53,683.3		Total.....	22,062.9
	Economic affairs	4,491.7		Agriculture, hunting, forestry and fishing	1,191.9
	Agriculture, forestry, fishing, and hunting	805.3		of which: Working capital credit	675.9
	Agriculture (and livestock)	603.9		of which: Investment capital credit	516.1
	Agriculture (and livestock) - Current				
	Agriculture (and livestock) - Capital				
	Forestry	22.8			
	Forestry - Current				
	Forestry - Capital				
	Fishing and hunting	178.7			
	Fishing and hunting - Current				
	Fishing and hunting - Capital				
	R&D Economic Affairs	235.3			
	R&D Agriculture, forestry, fishing and hunting (CS)	105.7			
	Environmental protection	526.9			
	Protection of biodiversity and landscape	440.2			
	Protection of biodiversity and landscape - Current	0.0			
	Protection of biodiversity and landscape - Capital				
	R&D Environmental protection	12.9			
	R&D Environmental protection - Current				
	R&D Environmental protection - Capital				
	Environmental protection n.e.c. (CS)				
FAO - FDI	Foreign Direct Investment Inflows to Agriculture	millions USD			
	Total.....	6,928.0			
	Primary	2,209.0			
	Agriculture, hunting, forestry and fishing	305.0			
	of which: Crop and animal production,				
	hunting and related service activities				
	of which: Forestry and logging				
	of which: Fishing and aquaculture				
	Secondary	2,412.0			
	Food, beverages and tobacco				
	of which: Manufacture of food products				
	of which: Manufacture of beverages				
	Tertiary	2,615.0			
	Unspecified				

Annex II. Global Agricultural Capital Stocks

