

Alerts for policy makers extracted from papers published during 2014 in volume 6 of food security

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This item summarizes very briefly papers published in volume 6 of Food Security for the year 2014, drawing attention to current and future critical issues in food and nutrition insecurity and measures that could be adopted to ameliorate them. Papers are arranged according to the three environments designated in the strap line of the journal—the Physical Environment, the Biological Environment (divided into crop production and pest control) and the Socio-Political and Economic Environment (divided into six sections). It is hoped that Policy Makers concerned with food and nutrition security will note the papers relevant to their particular sphere of influence and that they will be inspired to take early action. (Numbers after each entry refer to the pages on which the paper may be found in Volume 6 of the journal).

The physical environment

1. **Adapting to drought:** Bekele Megersa and associates suggest diversification of livestock as a means of ensuring food security among the pastoralists of Borana, Ethiopia (pp. 15–28)
2. **Climate change:** Aline Mosnier and associates take the view that adaptation to climate change should not be viewed as a local problem which is geographically isolated but should be seen in a global framework. Where regions are interconnected by trade and imports are taken into account, the overall impact of climate change may be positive (pp. 29–44).
3. **Land and water limitations:** Jianmin Li and Zhaohu Li assert that limited land and water are the main constraints to food production in China, particularly in the North

- China Plain. They advocate the strict protection of cultivated land against encroachment and raising the ratio of the agricultural use of water to other uses (pp. 159–167).
4. **Models for future land use:** Shinichiro Fujimori and associates point out that one of the key elements in general equilibrium models on a global scale for food security and agricultural assessment is land use. Constant elasticity transformation (CET) and logit functions in future scenarios were compared and the logit approach was found to be preferable if there were marked changes in consumption preferences from the base year, or if region-specific variables were the main focus of the study rather than global aggregates (pp. 685–699).
 5. **Temperature and precipitation in Africa:** Wenjiao Shi and Fulu Tao examined climate variables on the African continent during the period 1961 to 2010. They found that temperature increased and the precipitation and standardized precipitation evapotranspiration index (SPEI) decreased over the period and these correlated with a progressive decline in maize yields at the whole continent scale over the time period studied. In order to boost maize yields in the future, they advocate better irrigation and fertilizer application and development of maize varieties with greater heat and drought tolerance (pp. 471–481).
 6. **Water security in South Africa:** Sikhulumile Sinyolo and associates describe factors that affect the water security of households in the Mzinyathi district of South Africa. They found that the perception of water security had a direct effect on food security. Factors that promoted water security were off-farm income, membership of farmer associations, use of pumps, location at the upper-end of irrigation canals and training in collective water governance and water conservation techniques (pp. 483–499).
 7. **Roof top gardens as a source of food:** Francesco Orsini and associates point out that more than half of the world's population now lives in urban areas. This raises the

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question: to what extent can the urban environment provide food for its inhabitants? Taking Bologna as their experimental city, they report that roof top gardens there have the astonishing potential to grow more than 12,000 tonnes of vegetables annually, which is equivalent to 77 % of the inhabitants' requirements (pp. 781–792).

8. **Soil fertility and fertilizer constraints in India and China:** Nianjie Liu and associates report the results of a survey of 246 informants on the soil fertility and fertilizer constraints for rice and wheat in three intensive farming systems on the Indian subcontinent (India, Bangladesh and Nepal) and three in China. For rice, depletion of soil fertility and nitrogen deficiencies were usually responsible for decreased yields while, for wheat, these were caused by deficiencies not only in nitrogen fertilizer but poor management of other fertilizers as well. Remedial actions suggested include systematic testing of soil fertility, appropriate government subsidies for fertilizers, better management of fertilizer nutrients and improved varieties of the two cereals (pp. 629–643).
9. **Soil fertility management in Kenya:** Melinda Smale and associates point out that soil fertility in much of sub-Saharan Africa is low and that the rates of adoption of three practices, which are recommended to overcome this deficiency — the addition of amendments, application of inorganic fertilizers and control of erosion — are also low. They emphasize the importance of farmers being conversant with soil fertility management techniques and recommend security of tenure of the land they farm in order to encourage their practise: these policies together with better access to markets should particularly be targeted to women-headed households and young entrants into maize production (pp. 793–806).

The biological environment: productivity and constraints

Crop production

1. **Assessing the reliability of crop production data:** Victor Sadras and associates point out that reliability of crop production data is crucial for obtaining accurate information on yield gaps, trends in production over time and trading, which, in turn, influence policy decisions. Estimated production data from a pair of independent organizations in Nebraska, USA and another pair in Argentina showed congruence between the pairs within a small range in many cases, giving confidence that the estimates were accurate. However, there were considerable discrepancies in some of the data and, in those from Argentina, these appeared to be related more to estimates of area on which crops were grown rather than yield. As the data

were from only two sources it was not possible to say which was right and which wrong (pp. 447–449).

2. **Increasing yields by better crop husbandry methods:** Lindsey Norgrove and Stefan Hauser review research on plantain, published between 1976 and 2013 in West and Central Africa, where it is an important staple grown mainly by smallholder farmers. Topics included intercropping, fertilizer and mulch application, sucker sanitation methods and controlled yield loss studies on nematodes and the fungal disease, black sigatoka. Employing the best techniques and the highest yielding local landrace type, the authors claim that on-farm yields could be increased from 7.8 t ha⁻¹ to 35.5 t ha⁻¹ (pp. 501–514).
3. **Participatory plant breeding:** Conny Almekinders and associates describe the long-standing practice in the Netherlands of Participatory Plant Breeding as applied to potato, where it is regarded as a 'hobby', farmer-breeders seeking what is, in his or her view, the 'perfect potato'. This approach has resulted in a diversity of genotypes and has several attributes which the authors suggest could be of benefit to developing countries (pp. 515–524).
4. **Crop diversification:** Bernard Kamanga and associates, working in Malawi, examined the adoption of ten annual legumes by smallholder maize farmers, which had been promoted from 1998 to 2004 as a means to diversify food production and also to maintain soil fertility. The most important criterion for adoption was suitability as food and therefore soyabean and groundnuts were the front-runners. Contributions to soil fertility, owing to the ability of legumes (in combination with *Rhizobium*) to fix nitrogen and suppression of weeds were of secondary importance (pp. 45–59).
5. **Effect of social relationships on adoption of new crop varieties:** Liv Jensen and associates found, in a survey that encompassed over fifteen hundred households in Timor-Leste, that the factor, which was most strongly related to adoption of new crop varieties, was having a relationship with a grower of an improved variety and the closeness of that relationship. Social relationships should therefore be taken into account when formulating dissemination strategies for new crop varieties (pp. 397–409).
6. **Taking stock of GM:** Sylvie Bonny examines the genetically modified (GM) seed sector worldwide and puts it in the context of the seed sector as a whole. Production of transgenics is expensive and therefore unlikely to be pursued by any but the largest biotech companies. Addressing the concern that GM seed puts such seeds into the hands of very few companies (a major criticism of GM) she points out that it is important to distinguish "trait ownership" from "seed ownership". Thus, although the majority of the GM seeds in use in the US carry traits from Monsanto, a large proportion is commercialised by other seed companies. Perhaps such diffusion will, in time, allay

the fears of some who worry about the concentration of genotypes of important crop plants in the hands of few companies. In the meantime it would seem perverse to abandon this technology, which has already shown its benefits and has the potential to provide many more for humanity (e.g. golden rice), if allowed to do so (pp. 525–540).

Pest and disease control

1. **Cropping practices and disease management:** Serge Savary points out that “crop management and plant health management, are generally addressed as two distinct entities, the former often being seen as a source for options for the latter”. In contrast, he takes a more holistic approach, viewing both as parts of production situations. The paper is illustrated by models, taking into account, *inter alia*, whether the life cycle of the pathogen corresponds approximately to the growing season of the plant (monocyclic), severity of disease being principally contingent on the initial inoculum, or whether the pathogen has multiple cycles during the growing season (polycyclic), severity of disease being principally contingent on the secondary inoculum developed on the plant during its lifetime. The paper concludes with three examples of plant diseases and crop management: sheath blight of rice, coffee rust and Fusarium headblight of wheat (pp. 819–831).
2. **Plant disease control (1):** Fen Beed, promotes the concept of a crop health care system for sub-Saharan Africa (SSA) which would act pre-emptively rather than “belatedly combating large scale epidemics”. Besides illustrations of serious plant diseases, he discusses the feasibility of using biological control as a means of managing pathogens and gives the specific example of the control of toxigenic species of the fungal genus, *Aspergillus*. These are frequent contaminants of food, particularly in tropical climates, and the compounds that some species secrete, known as aflatoxins, are not only highly toxic but are also potent liver carcinogens (pp. 169–186).
3. **Plant disease control (2):** James Legg and colleagues draw attention to two virus diseases, Cassava Mosaic Disease and Cassava Brown Streak Disease, which are the two worst biological constraints to cassava production in sub-Saharan Africa. Both are spread by whiteflies, which have become super-abundant in recent years. The paper is a road map that details actions which must be taken immediately (1–4 years), in the medium-term (5–10 years) and long-term (11–20 years).
4. **Disease management techniques:** Rosalie Daniel and co-workers found that farmers in the Philippines identified management of severe diseases in durian and jackfruit in the Philippines, caused by *Phytophthora palmivora*, as their highest priority but there was limited understanding of them. In a three year participatory programme, trials were managed by growers, managers and extension staff. Benefit-cost analyses of the results allowed the formulation of three management packages—low-, medium- and high-input, giving farmers a choice according to their resources and capacities (pp. 411–422).
5. **Biological pest control (1):** Phosiso Sola and associates call attention to the renewed interest in pesticidal plants, owing to concerns about the safety of synthetic compounds, which are the principal means by which pre- and post-harvest diseases and infestations of crops are controlled. However, several factors are stacked against the deployment of pesticidal plants in sub-Saharan Africa. These include inconsistent efficacy of plant products, lack of data on efficacy and safety, the prohibitive cost of registration, and a conventional pesticides sector that is inadequately developed. They suggest that commercialisation of botanical pesticides in sub-Saharan Africa will require favourable environments not only for the propagation and cultivation of pesticidal plants but also for their commercial development, which will need favourable conditions in the areas of regulations and protocols for production, marketing and trade (pp. 369–384).
6. **Biological pest control (2):** David Grzywacz and associates advocate the use of biological control with natural enemies of harmful insects and pesticidal plant materials that are indigenous and are cheaper than synthetic alternatives. Two products, which show particular promise, are the endemic insect baculovirus, *Spodoptera exempta* nucleopolyhedrovirus (SpexNPV), effective against the African armyworm and the plant *Tephrosia vogelii*, which owes its insecticidal properties to compounds known as rotenoids (pp. 71–86).
7. **Rodent control:** Adam John draws attention to the enormous losses to agricultural production caused by rodents — for example in Asia where, according to one report, the annual amount of food lost would be sufficient to feed 200 million people. In his paper, which focuses on Southeast Asia, the author critiques the current dependency on rodenticides and makes a case for Ecologically-Based Rodent Management (EBRM). One of the EBRM systems relies on barriers and traps, the barrier, plastic fencing, excluding entrance to rice fields except at small gates, which contain the traps (249–260).
8. **Weed control:** Philomena Ogwuikwe and associates point out that weeds are a major constraint to productivity. Taking their data from nearly a thousand farmers in four countries, Cameroon, Democratic Republic of Congo, Togo and Uganda, they recorded the time taken to weed an upland rice crop manually once, twice or three times and the consequent yield increases: the times taken were 173, 259 and 376 h.ha⁻¹, and the yield increases were 1.2,

1.7 and 2.2 t.ha⁻¹, respectively. However, in order to increase food security and alleviate poverty in the region, instead of increasing manual weeding, they propose development of locally adapted labour-saving strategies for weed control (pp. 327–337).

The socio-political and economic environment

Assessing food insecurity

1. **Establishing criteria for identifying those in need:** Margarita Lovon and Astrid Mathiassen examined a Food Consumption Score (FCS), which is based on the number of days in a week eight food groups are eaten and is used by the World Food Programme, to identify those in need. Households are classified according to their scores as having poor, borderline or acceptable food consumption. However, they found that the thresholds were set too low and that it was not possible to define criteria that corresponded to caloric thresholds. They concluded that a future strategy should be to establish thresholds that reflect both the qualitative and quantitative aspects of food security.
2. **Food self-sufficiency and resource use in Rwanda:** Charles Bucagu and associates examined resource use and food self-sufficiency in two contrasting agro-ecological zones (AEZs) in Rwanda. At both sites, two-thirds or more of households were classified in the poorest of three resource categories, cultivating less than 0.2 ha and experiencing food deficit for 4–5 months every year. Calorie and protein availability were insufficient in the poorest resource group in one of the AEZs and in both the poorest and the moderate resource group in the other AEZ. In the latter, closing the maize yield gap would result in doubling the energy and protein intake (pp. 609–628).
3. **Increased food insecurity in Mozambique:** Arthur Mabiso and associates draw attention to the fact that between 2002 and 2008, food insecurity in rural areas of the country actually increased. This was because progress with the drivers of food security — increases in cash income per capita, receipt of agricultural extension services and increases in agricultural output and productivity — did not occur. It is to be hoped that the improvement of the country's economy, as a consequence of the projected energy boom, will enable appropriate attention to be paid to these drivers (pp. 649–670).

Access to food

1. **Poverty as the root of food insecurity:** Bruce Frayne and associates show that, among the urban poor in 11 Southern African cities, it is poverty that is at the root of food

insecurity and malnutrition and that therefore it is lack of access to food rather than lack of availability, which is the core of the problem. The authors also review the double burden of nutritional diseases owing to the co-existence of both malnutrition and obesity (pp. 101–112).

2. **The role of monetary income:** Ibrahima Bocoum and associates caution against the uncritical use of monetary income or expenditure indicators as measures of food insecurity. In Mali, they found about 35 % of households were either poor but satisfied their calorie requirements by eating cheap foods or were non-poor and failed to satisfy their calorie requirements owing to social obligations and high expenditure on health care or transport (pp. 113–130).
3. **Food insecurity in sub-Saharan Africa:** Laura Pereira and associates assert that, owing to a decline in subsistence agriculture across sub-Saharan Africa, there is an increased role for the private sector in food security strategies but that this is not sufficiently accounted for in food policy. They found that the purchase of food by the rural poor was an important food security strategy but that they were constrained by lack of income. Moreover, in consequence, they were liable to diet deficiencies owing to inadequate access to essential micronutrients (pp. 339–357).
4. **Wild edible plants as contributors to diet:** Céline Termote and associates collected and identified a formidable array of wild edible plants (WEPs) that grow in the buffer zone around the Lama forest in Benin and investigated the contribution some of these make to women's diets. They found that the diet diversity of those who consumed WEPs was greater than those who did not but the contribution of the wild flora to the diet was low owing to infrequent use and small portion sizes. The authors suggest that, before widely promoting the use of WEPs, further investigations should be undertaken into their nutrient composition, sustainable harvest levels and possible integration into the cultural and commercial life of the local people (pp. 833–849).
5. **Fish as contributors to food security of inhabitants around Lake Victoria:** Kathryn Fiorella and associates investigated whether fishing households on Mfangano Island in Lake Victoria, Kenya, where non-native Nile perch were introduced in the 1960s, ate more fish and were more food secure than non-fishing households. Neither hypothesis was supported by the data they obtained: rather household food security was associated with higher incomes and asset index scores. Nile perch was predominantly sold and, indeed, Lake Victoria supports an international export market of this fish, prompting the question as to whether local hunger is associated with the growth of the Nile perch fishery (pp.851–860).
6. **Role of street food in food security in Indian cities:** Kirit Patel and associates report that street food vendors in cities such as Madurai, who themselves are poor, provide

a variety of foods for the poor, among which millet-based porridges, which are nutritious and have a low glycaemic index, are popular. However, this is not recognized in state-led food security policies, which view the urban poor simply as beneficiaries of subsidized grain and vendors of street food as public nuisances. To the contrary, the authors suggest that the state could improve urban food security by recognizing and strengthening the rights and capabilities of street vendors (pp. 861–878).

Governance

1. **Governance as part of the problem of food insecurity:** Jeroen Candel has made a systematic survey of the literature of food security relating to governance in which he found that governance was viewed predominantly as a problem-solving mechanism rather than being part of the problem. He advocates empirical investigation of current governance arrangements, particularly at sub-national levels. The results from these, it is hoped, would form a baseline from which better policies could emerge (pp. 585–601)
2. **Land tenure and extension:** Wayne Ganpat and associates, working in Trinidad, found that the most important factors governing compliance with Good Agricultural Practices were land tenure and the number of visits to farms by members of the extension service. They advocate urgent action by the government to regularize farmers' tenancy arrangements and better education of the extension service (pp. 61–69).
3. **Response to price shocks:** Rui Benfica found that in both rural and urban areas of Malawi, the poorest households carried the heaviest burden of food price increases. The author suggests that households should be compensated for welfare losses resulting from price shocks by strengthening social protection interventions. These could include direct cash transfers and labour intensive public works programmes (pp. 131–145).
4. **Alternative development policies:** Vito Cistuli and associates highlight two opposing development policies; one "spatially-blind" which promotes economic agglomeration in the most dynamic areas of a country and the other, which takes the view that all territories matter and that policies should be tailored to the specific requirements of each. Certainly it would seem that the latter policy would benefit the poorer territories more directly and prevent their being left behind, but rapid development of the most dynamic areas of a country is seductive. A combination of both policies would seem appropriate, but determination of the optimal proportions of each presents an interesting econometric problem (pp. 879–894).
5. **Difficulties in establishing plant disease clinics in Uganda:** Solveig Danielsen and associates report that the Ugandan government, in 2010, adopted plant health

clinics in order to improve extension services for farmers and to contribute to the surveillance of plant disease. Unfortunately, the implementation of the programme has been impeded owing to changes in Government policies, which involved decentralization and reforms of agricultural extension. The authors conclude that their experience demonstrates the necessity of fully understanding the local political environment and taking it into account in order for such programmes to operate successfully (pp. 807–818).

Empowerment

1. **National farmers' organizations:** Giel Ton and associates describe the successes a programme, named Empowering Smallholder Farmers in Markets, has had in 11 countries. Working with National Farmer Organisations (NFOs), many and diverse key issues were identified where strengthening of advocacy contributed to successful outcomes. As a result, the authors suggest earmarking funds for NFO-led research support in order to facilitate the participation of smallholders in the design and monitoring of development policies (pp. 261–273).
2. **Female participation in farming:** Amy Trefry and associates describe the roles of culture and home gardens in the Eastern Cape Province of South Africa. They found a positive relationship between female participation in agriculture and food security, but that the women often lacked the power to obtain the resources for achieving good yields. The study also emphasized the role of the local gardening programme in maintaining a "culture of farming" (pp. 555–565).

Nutrition, food security and safety

1. **Improved crop varieties:** Menale Kassi and associates examined the impact on food security in rural Tanzania of improved maize varieties, which yielded, on average, 1.2 t per hectare compared to 0.5 t per hectare for local varieties. Chronic and transitory food security were reduced from between 0.7 and 1.2 % and between 1.1 and 1.7 %, respectively, for every acre increase in area planted to the improved varieties (pp. 217–230).
2. **Combining agriculture and aquaculture:** Nesar Ahmed and associates promote the practice of combining aquaculture and agriculture either on a pond basis or as a combination of rice and fish farming. These techniques not only have considerable potential for increasing food production and enhancing its nutritional quality but also of reducing risks associated with water scarcity (pp. 767–779).
3. **Food Security in Iran:** Nahid Salarkia and associates report results of an adapted Household Food Insecurity

Access Scale (HFIAS) to study food insecurity in the urban area of Varamin, a city 30 km to the south of Tehran, Iran in 2009. Among the sobering statistics were the findings that only 21 % of households were food secure and in more than half the households (54.3 %) the ratio of calorie consumption to the Recommended Daily Allowance (RDA) was below 70 % (pp. 275–282).

4. **Food Security in West Timor:** Bronwyn Myers and associates investigated the impacts of a government subsidized rice programme on poor households in West Timor, where the traditional staple is maize. When the subsidized rice became available, all of the households interviewed bought it, but because of a preference for maize about 30 % did not buy it again. Of those that bought it more than once, about half did so infrequently through lack of cash, suggesting a targeting failure, and some sold their own produce to purchase the subsidized rice, perversely leading to a poorer diet and food shortages (pp. 385–395).
5. **Nutrition-sensitive agriculture in Bangladesh:** K. M. M. Rahman and M.A. Islam report that there has been considerable progress in nutrition-sensitive agriculture in Bangladesh with reduction of deficiencies in vitamin A and iodine, the latter owing to the availability to an increased proportion of the population of iodized salt. Progress in other spheres include significant increases in the production of rice, potato, vegetables and the aquaculture of small fish. The authors particularly single out the Adivasi Fisheries Project as one that has been very successful in up-scaling the nutritional status of the poor and ultra-poor in the north-western and northern regions of Bangladesh. However, undernutrition of children under 5 years old is still rife in the country with 41 % stunted, 16 % wasted and 36 % underweight (pp. 671–183).
6. **Setting sensible safety limits to undesirable substances in food:** Kees Olieman points out that the concept of zero tolerance of a substance is not valid if zero means not detectable. Methods of detection are becoming ever more sensitive, thus it is essential that concentrations of undesirable substances in food are set at levels at which, as far as can be ascertained, there is no effect.

Economic events and policies in relation to food insecurity

1. **The effects of grain export restrictions in Russia, Ukraine and Kazakhstan (RUK) on global food security:** Thomas Fellman and associates, using

AGLINK-COSIMO, a partial equilibrium modelling framework and the main tool of the OECD-FAO agricultural outlook process, showed the importance of RUK's grain production for world markets and global food security. Limited production would cause substantial price increases and these would have adverse effects on importing countries. The authors therefore advocate greater cooperation among exporting countries in order to avoid this (pp.727–742).

2. **Economic shocks:** Aikaterini Kavalleri and associates ask if shocks in economic growth cause “shocking effects on food security”. Using a supply–demand model they find that higher economic growth influences demand more than supply. The effect of this on developing countries is that their trade balance improves but this does not necessarily result in better food security. Conversely, in an economic downturn, developing countries import more and increase their per capita food calorie intake but this increased reliance on imports renders them more vulnerable to disruptions of world agricultural markets (pp. 567–583).
3. **Cash cropping:** Tal Lee Anderman and associates found that, despite recommendations of cash cropping to improve food security, as the cash generated could be used for food purchases, there was a negative relationship in Ghana between the intensity of cash crop production (Cacao and oil palm) and the three pillars of food security—availability, access and utilization (pp. 541–554).
4. **The economics of diet:** James Ward and associates used Linear Programming to explore dietary preferences (high meat versus vegetarian) and the possibility of urban agriculture making a significant contribution to food security in Northern Adelaide, Australia. They found that the optimal crop regime in urban agriculture and its impact depended on diet, especially how much meat was consumed. However, a typical suburban backyard could produce 10–15 % of dietary protein with or without chicken meat, allowing savings of around AU\$1 per person per day (pp. 701–718).
5. **Milk sufficiency in India:** Anjani Kumar and associates point out that milk and milk products are important constituents of the Indian food basket and expenditure per capita on them increased from 11.5 to 14.9 % in rural areas and from 15.7 to 18.4 % in urban areas between 1983 and 2009–10. In order to meet the demand projected for 2026–7, they calculate that India would need to maintain the current growth rate of 3.7 % per annum and could become an exporter if the rate were higher (pp. 719–726).